P.37 (4)

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]By determining that an accommodation channel number will suppress traffic change in a self-cell in a mobile communications system characterized by comprising the following based on the past communication traffic, A mobile communications system assigning a sound and data to each channel according to this accommodation channel number.
Two or more base stations.
Two or more mobile stations connected to these base stations via a wireless circuit.

[Claim 2]In a channel assignment method of a sound in a mobile communications system, and data characterized by comprising the following, By determining that an accommodation channel number will suppress traffic change in a self-cell based on the past communication traffic, A sound in a mobile communications system containing a channel assignment step which assigns a sound and data to each channel according to this accommodation channel number, and a channel assignment method of data.
Two or more base stations.
Two or more mobile stations connected to these base stations via a wireless circuit.

[Claim 3]Said channel assignment step determines an accommodation channel number from past line switching traffic and packet traffic which are said communication traffic, A sound in the mobile communications system according to claim 2 by which a delay step which holds a fixed channel number by delaying this packet being included when a channel assignment demand more than this channel number occurs and a channel assignment method of data.
[Claim 4]In a case where said channel assignment step holds said channel number uniformly, A sound in the mobile communications system according to claim 3 by which an increase step in a channel which increases a channel number to assign being included when said packet exceeds a predetermined delaying amount, and a channel assignment method of data.
[Claim 5]Past line switching traffic and packet traffic in which said channel assignment steps are data length of a packet, and said communication traffic, Based on an accommodation channel number ** determined, assign a sound and data to each channel according to this accommodation channel number, and further, at the time of an end of data communications, so that a rapid change of a channel number or traffic may not occur, A sound in a mobile communications system of any one statement of claim 2-4 performing channel assignment of a sound and data, and a channel assignment method of data.
[Claim 6]Based on data length of a packet which will assign a channel from now on, and data length of a packet already assigned to a channel, said channel assignment step by performing channel assignment of a sound and data, A sound in a mobile communications system of any one statement of claim 2-5 controlling change of a rapid channel number generated at the time of an end of data communications, and a channel assignment method of data.

[Translation done.]

37 pgs

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the channel assignment method of the sound in the mobile communications system which applied DS-CDMA, and data.
It is related with the channel assignment method in the radio between two or more base stations which constitute two or more radio area especially, and a mobile station.

[0002]
[Description of the Prior Art]Hereafter, the channel assignment method of the sound in the conventional radio and data (it is henceforth called a data packet) is explained. In the mobile communications system which applied DS-CDMA (Direct Sequence Code division multiple access). Two or more base stations constitute the communications area called a cell, and a mobile station and a base station generate a link by radio in the cell, and it communicates. In this mobile communications system, the radio signal (a sound and data) transmitted from two or more mobile stations is transmitted to a base station, for example.
[0003]The radio signal transmitted to these base stations is Eb/I0 (ratio of the signal power and interference power per bit). Maintaining at a constant level is dramatically important, The mobile communications system which applied DS-CDMA is a system that the line quality of other mobile stations deteriorates, when data is transmitted with the big electric power that Eb/I0 of one mobile station becomes good, for example. Therefore, in the mobile communications system which applied DS-CDMA, in order to keep constant Eb/I0 of the radio signal transmitted to a base station, transmission power control by each mobile station is performed, for example.
[0004]Drawing 8 for example, Literature RCS97-103 (Institute of Electronics, Information and Communication Engineers .). THE INSTITUTE OF ELECTRONICS, INFORMETION AND COMMUNICATION ENGINEERS. ; **** technique TECHNOCAL REPORT OF IBICE. It is the figure which is shown in SST97-64 and RCS97 103 (1997-09) and in which showing the outline of the conventional channel assignment method.
For example, channel assignment of the reservation packets (transmission data packet by a mobile station number) for every moving machine shown in drawing 9 is carried out [sound].

[0005]Drawing 8 shows the relation of the data packet and time-axis which were transmitted from two or more base stations. The conventional channel assignment methods shown here are a circuit switching system (voice communication) of a system, and a communications system with which the packet exchange system of a system and ** are intermingled at the time of ** instancy.
It is premised on using request-to-print-out-files assignment of packet channels especially at the time of transmission of a packet.
Let the number in each reservation packets in drawing 8 and drawing 9 be the individual number assigned for every mobile station.
[0006]In the channel assignment method of the conventional reservation packets, a base station gives a data packet transmission permission after fixed time to each mobile station which transmits each reservation packets, and each mobile station transmits a data packet at any time in response to this

transmission permission as a graphic display shows. However, the number of mobile stations which transmits a data packet to a base station is restricted as a base station gives delay directions and shows drawing 8 to the mobile station which transmits those reservation packets, when an accommodation channel number exceeds the predetermined capacity limit decided by Eb/I0 at this time. Speaking concretely, delaying the corresponding data packet by drawing 8 by giving delay directions to the 5th mobile station as an arrow.

[0007]It generates with the conventional mobile communications system, for example, about change of the traffic by the call origination and clear back of a mobile station, to each mobile station, a base station transmits transmission power changing instruction, and is performing transmission power control with each mobile station each time. Thus, in the channel assignment method in the conventional radio. By restricting the transmission power control by each above-mentioned mobile station, and the number of mobile stations which transmits packet data, it is communicating so that a sound and data can maintain fixed quality, namely, so that Eb/I0 can be maintained at a constant level.

[0008]

[Problem(s) to be Solved by the Invention]However, as for the above and change of the traffic generated with the conventional mobile communications system, a rapid change of interference quantity may be brought about (change of the time t8 of drawing 8, etc.). And in a base station, transmission power changing instruction is transmitted to each mobile station so that the received power from each mobile station may become fixed. In such a case, in each mobile station, since the transmission power variation by one-time transmission-power-control directions had restriction, change of this rapid traffic had a problem that transmission power control could not be followed.

[0009]When it was the same as that of the above, even if it was a case where transmission power control was performed by each mobile station, there was a problem that line quality deteriorated for example, until transmission power control is completed.

[0010]Since transmission power was increased by many mobile stations at the time of interference generating accompanying the increase of traffic in the conventional channel assignment method, there was a problem that the power consumption will be consumed vainly.

[0011]This invention was made in view of the above, and is ****. Without change of the traffic by the call origination and clear back of ** generating the rapid change of interference quantity used as a factor, the purpose so that fixed communication quality can be maintained, It is obtaining the channel assignment method of the data in the mobile communications system which can perform channel assignment of a sound and data, and its system.

[0012]

[Means for Solving the Problem]If it is in a mobile communications system concerning this invention in order to solve a technical problem mentioned above and to attain the purpose, Two or more base stations (equivalent to the base station 101 of an embodiment mentioned later), and two or more mobile stations (equivalent to the mobile stations 1-10) connected to these base stations via a wireless circuit, A sound and data are assigned to each channel according to this accommodation channel number by determining that an accommodation channel number will suppress traffic change in a self-cell based on communication traffic of a preparation and the past (refer to drawing 1).

[0013]According to this invention, since a channel is assigned based on an average of the past accommodation channel number which is a statistical work result of the past communication traffic, traffic change in a self-cell can be suppressed low. Thereby, change of traffic like the conventional mobile communications system does not occur. In the conventional mobile communication system, line quality deteriorates, for example until transmission power control is completed, but in a mobile communications system of this invention, since traffic change is suppressed low, quality of a circuit does not deteriorate. In a mobile communication system concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the power consumption will not necessarily be vainly consumed like before.

[0014]If it is in a channel assignment method concerning the next invention, By determining that an accommodation channel number will suppress traffic change in a self-cell based on the past communication traffic, A channel assignment step (equivalent to Step S1 of an embodiment mentioned later - Step S8, Step S11 - Step S14, Step S21 - Step S26) which assigns a sound and data to each

channel according to this accommodation channel number is included.
[0015]According to this invention, since a channel is assigned based on an average of the past accommodation channel number which is a statistical work result of the past communication traffic, traffic change in a self-cell can be suppressed low. Thereby, change of traffic which was generated by the conventional channel assignment method does not occur. In a conventional channel assignment method, line quality deteriorates, for example until transmission power control is completed, but in a channel assignment method of this invention, since traffic change is suppressed low, quality of a circuit does not deteriorate. In a channel assignment method concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the power consumption will not necessarily be vainly consumed like before.
[0016]In a channel assignment method concerning the next invention, said channel assignment step, By determining an accommodation channel number from past line switching traffic and packet traffic which are said communication traffic, and delaying this packet further, when a channel assignment demand more than this channel number occurs, A delay step (equivalent to Step S3 - Step S5 of an embodiment which are mentioned later) holding a fixed channel number is included.
[0017]Since a required channel number is determined from past line switching traffic and packet traffic according to this invention, When a channel assignment demand more than an accommodation channel number occurs (i.e., when reservation packets are transmitted from a mobile station), a channel number and communication traffic can be uniformly held by making a transmission data packet corresponding to the reservation packets stand by.
[0018]In a channel assignment method concerning the next invention, said channel assignment step, When holding said channel number uniformly and said packet exceeds a predetermined delaying amount, an increase step in a channel (equivalent to Step S11 of an embodiment mentioned later, Step S13, and Step S14) which increases a channel number to assign is included.
[0019]When a channel assignment demand more than an accommodation channel number occurs according to this invention (i.e., when reservation packets are transmitted from a mobile station), A transmission data packet corresponding to the reservation packets is made to stand by, and let values of an accommodation channel number be the past average channel number and a value of the sum of predetermined number:N (arbitrary constants determined by a system) further. At this time, it may determine for predetermined number:N to be good also as an accommodation channel number before assigning a transmission data packet corresponding to new-arrival reservation packets, or not to exceed a fixed rate of change with a quota channel number of a transmission data packet. Thereby, channel assignment can be performed, suppressing change of traffic low.
[0020]In a channel assignment method concerning the next invention, said channel assignment step, Data length of a packet, and past line switching traffic and packet traffic which are said communication traffic, Based on an accommodation channel number ** determined, assign a sound and data to each channel according to this accommodation channel number, and further, at the time of an end of data communications, so that a rapid change of a channel number or traffic may not occur, Channel assignment of a sound and data is performed (equivalent to Step S7 of an embodiment mentioned later).
[0021]According to this invention, since channel assignment is performed based on data length of a packet, reduction of a channel number accompanying an end of data communications can be suppressed, and, thereby, change of rapid traffic can be prevented.
[0022]In a channel assignment method concerning the next invention, said channel assignment step, Based on data length of a packet which will assign a channel from now on, and data length of a packet already assigned to a channel, by performing channel assignment of a sound and data, Change of a rapid channel number generated at the time of an end of data communications is controlled (equivalent to Step S7 of an embodiment mentioned later).
[0023]A final slot of data length of a packet which performs channel assignment after this according to this invention, Since a final slot of data length of a packet already assigned to a channel checks directly and channel assignment is performed according to the identification result, reduction of a channel number accompanying an end of data communications can be suppressed to the minimum. Thereby, change of rapid traffic can be prevented more powerfully.
[0024]

[Embodiment of the Invention]Below, the embodiment of the channel assignment method of the data in the mobile communications system concerning this invention and its system is described in detail based on a drawing. This invention is not limited by this embodiment.
[0025]Drawing 1 shows the channel assignment result of the sound and data (it is henceforth called the transmission data packet) based on the mobile communications system which realizes the channel assignment method concerning this invention. This channel assignment result is the result of assigning a channel between the base station 101 which constitutes a communications area as shown in drawing 2, for example, each mobile station (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), and **.
[0026]Hereafter, the channel assignment method concerning this invention is explained concretely. First, drawing 3 shows the state where the reservation packets from two or more mobile stations as shown in drawing 2 arrived to the base station at random, for example, shows each of those reservation packets on the basis of a time-axis. Drawing 4 shows typically the packet length of each transmission data packet contained in the reservation packets shown in drawing 3 as information.
[0027]When those reservation packets are transmitted by the random access channel, two or more reservation packets may arrive at a base station simultaneously, for example as a graphic display (equivalent to the time t0 and t7). The number of the reservation packets in drawing 2 expresses the classification (equivalent to the mobile station 1 - the mobile station 10 which are shown in drawing 2) of each mobile station. In this embodiment, a channel shows the channel realized by the spread code in a DS-SDMA method. It is not necessary to necessarily transmit reservation packets per slot in each mobile station, and is still better also as transmitting to a base station using channels other than a random access channel.
[0028]Drawing 5 shows the flow chart of the concrete channel assignment method performed with the mobile communications system of this invention. In the channel assignment method concerning this invention. Instancy with the circuit switching system (voice communication) of a system, and the communications system with which the packet exchange system of a system and ** are intermingled at the time of **. As it is premised on using request-to-print-out-files assignment of packet channels especially and is further shown in drawing 1, Two voice communications are already assigned using said circuit switching system, the data packet x1 and x2 are assigned before the time t1, and it is premised on the case where the past average accommodation channel number is 4. [finishing / channel assignment]
[0029]For example, in the time t0 shown in drawing 3, the value of suspended number of reservation packets:RSVbuf or more in one. Or when the value of number of new-arrival reservation packets:RSVnew from each mobile station is one or more (Step S1, Yes), a priority is given to the reservation packets suspended before the time t0, and the packet priority table which a base station has is updated (Step S2). When number of reservation packets:RSVbuf suspended before the time t0 is 0 at this time, a priority will be the highest for the reservation packets transmitted from a mobile station in the time t0.
[0030]On the other hand, when the value of both number of reservation packets:RSVbuf suspended before the time t0 and number of new-arrival reservation packets:RSVnew is 0 (Step S1, No), channel assignment of a transmission data packet is not performed (end). However, a base station performs weighting for the packet length information on the send data contained in the reservation packets which a mobile station transmits to a basis and each reservation packets, and is good also as creating a packet priority table based on the eclipse ********** with dignity. The number of the mobile station with which the priority of reservation packets is set up beforehand. (for example, considerable from 1 of drawing 3 to 10) For example, it is good also as determining by the priority number included in reservation packets, or good also as determining that change of the accommodation channel number at the time of the end of a telephone call will become the smallest.
[0031]Next, in a base station, a transmission data packet, the sound of a line switching, and accommodation [** and others] channel number:ASSch are updated (Step S3). Here, the updating method of accommodation channel number:ASSch is explained in detail according to drawing 6.
[0032](For example, the past average traffic (here), i.e., average accommodation channel number:TRAFave before [a channel assignment time to] T hour) it is previously defined as 4 -- **** -- with number of new-arrival reservation packets:RSVnew. When larger than channel number:RSVold already assigned in the following slot, and the sum of suspended number of reservation packets:RSVbuf

(Step S11, Yes), as for the value of accommodation channel number:ASSch, the value of TRAFave is assigned as it is (Step S12). When TRAFave does not become an integer from the channel assignment time in the average before T hour, it is better also considering the integer large nearest to an average channel number as TRAFave than considering the value which omitted below the decimal point, or an average channel number.

[0033]In the case (Step S11, No) where TRAFave is smaller than the sum of RSVnew, RSVold, and RSVbuf on the other hand, The transmission permission delay value of the transmission data packet corresponding to the reservation packets concerned : the value of Tbuf, Transmission permission maximum delay time of the transmission data packet corresponding to the suspension reservation packets concerned : in the case where it is smaller than DLYmax. Or the product of TRAFave and Tbuf is a Request-to-Send data packet total of all the new-arrival reservation packets :P new, Request-to-Send data packet total of suspension reservation packets :P When smaller than the sum with buf (Step S13, Yes), the value of accommodation channel number:ASSch assigns the value of the sum of TRAFave and predetermined number:N (arbitrary constants determined by a system) (Step S14).

[0034]And in the case (Step S11, No) where TRAFave is smaller than the sum of RSVnew, RSVold, and RSVbuf, The value of Tbuf is larger than DLYmax, and when the product of TRAFave and Tbuf is still larger than the sum of Pnew and Pbuf (Step S13, No), as for the value of accommodation channel number:ASSch, the value of TRAFave is assigned as it is (Step S12).

[0035]It may determine for the above-mentioned predetermined number:N to be good also as an accommodation channel number before assigning the transmission data packet corresponding to new-arrival reservation packets, or not to exceed a fixed rate of change with the quota channel number of a transmission data packet. When determining not to exceed the fixed rate of change which has a quota channel number of a transmission data packet in N, it is good also as making the rate of change into ten percent, and, for example, Or it is good also as a value that change of interference quantity is set to less than 1 dB, or good also as a difference of ASSch and RSVold.

[0036]Thus, after updating accommodation channel number:ASSch (Step S3) in a base station. When ASSch and RSVold which were updated are compared (step S4) and RSVold is less than ASSch (step S4, No), Channel assignment of the transmission data packet corresponding to the reservation packets concerned is performed, packet transmission instruction is performed to the mobile station which corresponds when channel assignment is possible (Step S6, Yes) (Step S7), and a packet priority table is updated again (Step S2). When channel assignment is impossible (Step S6, No), it ends without performing channel assignment.

[0037]On the other hand, in the comparison in step S4, when RSVold is more than ASSch (step S4, Yes), standby directions are performed to the mobile station corresponding to the reservation packets concerned (Step S5).

[0038]Here, the channel assignment method in Step S6 is explained in detail according to drawing 7. First, for example, reservation packets with the highest priority are chosen out of the packet priority table updated beforehand (Step S21). Ask for the number of change of the accommodation channel by assigning selected reservation packets, and And the number of change of this accommodation channel, Comparison with the number C of accommodation channel acceptable variations set up beforehand is performed (Step S22), for example, when the number of accommodation channel changes is below C (Step S22, Yes), channel assignment of the transmission data packet corresponding to selected reservation packets is performed (Step S23). Also when delaying amount:DLYmax of reservation packets with the highest priority exceeds reservation-packets maximum delay permitted amount:DLYlim set up beforehand in comparison of Step S22 (Step S22, YES), Channel assignment of the transmission data packet corresponding to reservation packets with the highest priority is performed (Step S23).

[0039]On the other hand, in comparison of Step S22, when said number of accommodation channel changes is larger than C (Step S22, No), reservation packets with a high priority are chosen next from the packet priority tables updated beforehand (Step S24). And the number of reservation packets from the one where the priority decided [reselecting beforehand and] is higher to the reservation packets which can be reselected, Predetermined number: Compare L (Step S25), ask for the number of accommodation channel changes by assigning the reselected reservation packets, when the number of reservation packets which can be reselected is below L (Step S25, Yes), and perform comparison with

the rate of an accommodation channel change, and C again (Step S22). The value of C is good also as a fixed value set up beforehand. Or it is good also as a value which can be found from the rate corresponding to an accommodation channel number. The number of accommodation channel changes may include the accommodation channel change not only accompanying change produced by assigning reservation packets but the end of communication of the already accommodated channel.
[0040]In comparison of Step S25, when the reselected number of reservation packets is larger than L, or when there are no reservation packets to choose (Step S25, No), channel assignment is not performed (Step S26).
[0041]Below, the case where the transmission data packet (refer to drawing 4) corresponding to the reservation packets of drawing 3 is assigned is actually explained in accordance with drawing 5, drawing 6, and the channel assignment method of drawing 7. When the value of T is made into 2 packet-slots length, for example, an average channel number cannot be accepted here, The integer small nearest to an average channel number is set to TRAFave from an average channel number, 1 and maximum delay permitted amount:DLYlim of reservation packets for the number L of reservation packets which can be reselected [1 and] 5 packet length, [the value of Tbuf] [the value of the past of 2 and TRAFave] [4 and the rate C of a permission accommodation channel change] Predetermined number: Explain channel assignment operation when the reservation packets of drawing 2 arrive at a base station, assuming N to be 1.
[0042]When a base station receives reservation packets, a base station, After fixed delay, packet transmission instruction (Step S8 of drawing 5) and standby directions (Step S5 of drawing 5) shall be performed, and a mobile station shall also transmit a transmission data packet after fixed delay in response to the packet transmission instruction concerned and standby directions further. Here, let transmission delay time of a mobile station and a base station be 1 packet-slots length, for example.
[0043]Therefore, corresponding to the reservation packets which the mobile station transmitted, in a base station, packet transmission instruction is given after 1 packet-slots length, and it is 1 also with after that and a mobile station. A transmission data packet will be transmitted after packet-slots length. In this embodiment, even when not performing standby directions, it is good also as standby directions to have not taking out directions from a base station to a mobile station. The transmission delay time of a mobile station and a base station may be longer than 1 packet-slots length, and is not this limitation.
[0044]First, in the time t1 shown in drawing 3, there are no reservation packets suspended before the time t0, Since TRAFave is 4, RSVold is 2, RSVnew is 2 (reservation packets (1), reservation packets (2)) and RSVbuf is 0 (Step S11, Yes), accommodation channel number:ASSch is 4. Therefore, at the time t2 of drawing 1, a base station performs channel assignment of a transmission data packet (1) and a transmission data packet (2), and performs packet transmission instruction further here to the mobile station which transmitted reservation packets (1) and reservation packets (2).
[0045]Next in the time t2 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 1 (reservation packets (3)), RSVbuf is 0 (Step S11, No), and DLYmax is 0 further, The product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 5, and since Pbuf is 0 (Step S13, No), accommodation channel number:ASSch is set to four and performs suspension directions in a base station to the mobile station which transmitted reservation packets (3).
[0046]Next in the time t3 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 1 (reservation packets (4)), RSVbuf is 1 (reservation packets (3)) (Step S11, No), DLYmax is 1 (reservation packets (3)) and the product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 4, and since Pbuf is 5 (Step S13, No), accommodation channel number:ASSch is set to four and performs suspension directions in a base station to the mobile station which transmitted reservation packets (4).
[0047]Next in the time t4 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 0 -- RSVbuf -- two (reservation packets (3).) It is reservation packets (4) (Step S11, No), and DLYmax is 2 (reservation packets (3)) further, The product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 0, and since Pbuf is 9 (Step S13, No), accommodation channel number:ASSch is set to four and directs nothing in a base station.
[0048]Next in the time t5 shown in drawing 3, TRAFave is 4, Since a data packet (1) is completed, RSVold is 3, and RSVnew is 1 (reservation packets (5)), RSVbuf is 2 (reservation packets (3), reservation packets (4)) (Step S11, No), The product of TRAFave (=4) and Tbuf (=3) is 12, DLYmax is 3

(reservation packets (3)), Pnew is 3, and since Pbuf is 9 (Step S13, Yes), accommodation channel number:ASSch is set to five. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t6 of drawing 1, for example. Channel assignment of the transmission data packet (3) corresponding to reservation packets (3) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (3).

[0049]The transmission data packet corresponding to reservation packets (4) which is next reservation packets with a high priority is received, TRAFave is 4, RSVold is 4 and RSVnew is 0, RSVbuf is 2 (reservation packets (4), reservation packets (5)) (Step S11, No), DLYmax is 2 (reservation packets (4)) and the product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 0, and since Pbuf is 7 (Step S13, No), accommodation channel number:ASSch is set to four and directs nothing in a base station. That is, assignment of a new channel is not performed.

[0050]Next in the time t6 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 0 -- RSVbuf -- two (reservation packets (4).) It is reservation packets (5) (Step S11, No), and DLYmax is 3 (reservation packets (4)) further, The product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 0, and since Pbuf is 7 (Step S13, Yes), accommodation channel number:ASSch is set to five.

[0051]If a priority is determined as the arrival order of reservation packets in a base station at this time, although a priority becomes high from reservation packets (5), reservation packets (4), Since the communication finish time of a data packet (3) and the communication finish time of a data packet (4) which have already completed channel assignment will turn into the time if reservation packets (4) are chosen, change of an accommodation channel number gives priority to and chooses fewer reservation packets (5). . Therefore, in a base station, change of an accommodation channel number is fewer reservation packets at the time t7 of drawing 1, for example. Channel assignment of the transmission data packet (5) corresponding to reservation packets (5) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (5).

[0052]Next, in the time t7 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of one voice communication, and since RSVnew is 0 (Step S11, Yes), accommodation channel number:ASSch is set to four. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t8 of drawing 1, for example. Channel assignment of the transmission data packet (4) corresponding to reservation packets (4) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (4).

[0053]Next in the time t8 shown in drawing 3, TRAFave is 4, RSVold is 4, RSVnew is 3 and RSVbuf is 0 (Step S11, No), The product of TRAFave (=4) and Tbuf (=3) is 12, DLYmax is 0, Pnew is 10, and since Pbuf is 0 (Step S13, No), accommodation channel number:ASSch is set to four and directs nothing in a base station. That is, assignment of a new channel is not performed.

[0054]Next in the time t9 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of the data packet 5, and RSVnew is 0, RSVbuf is 3 (reservation packets (6), reservation packets (7), reservation packets (8)) (Step S11, No), The product of TRAFave (=4) and Tbuf (=3) is 12, DLYmax is 1, Pnew is 0, and since Pbuf is 10 (Step S13, No), accommodation channel number:ASSch is set to four. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t10 of drawing 1, for example. Channel assignment of the transmission data packet (6) corresponding to reservation packets (6) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (6).

[0055]Next in the time t10 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of a data packet (3), and RSVnew is 0, RSVbuf is 2 (reservation packets (7), reservation packets (8)) (Step S11, No), The product of TRAFav (=4) and Tbuf (=3) is 12, DLYmax is 2, Pnew is 0, and since Pbuf is 10 (Step S13, No), accommodation channel number:ASSch is set to four. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t11 of drawing 1, for example. Channel assignment of the transmission data packet (7) corresponding to reservation packets (7) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (7).

[0056]Next in the time t11 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of

communication of a data packet (4), and RSVnew is 1 (reservation packets (9)), RSVbuf is 1 (reservation packets (8)) (Step S11, No), and further, since DLYmax is 3 (Step S13, Yes), accommodation channel number:ASSch is set to five.
[0057]If a priority is determined as the arrival order of reservation packets in a base station at this time, although a priority becomes high from reservation packets (9), reservation packets (8), Since the communication finish time of a data packet (6) and the communication finish time of a data packet (8) which have already completed channel assignment will turn into the time if reservation packets (8) are chosen, change of an accommodation channel number gives priority to and chooses fewer reservation packets (9). . Therefore, in a base station, change of an accommodation channel number is fewer reservation packets at the time t12 of drawing 1, for example. Channel assignment of the transmission data packet (9) corresponding to reservation packets (9) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (9).
[0058]In a base station, ASSch is updated again after updating a packet priority table. At this time, TRAFave is 4 and RSVold is set to four with the end of communication of a data packet (4), and assignment of a data packet (9), RSVnew is 0, RSVbuf is 1 (reservation packets (8)) (Step S11, No), further, since DLYmax is 4 (Step S13, Yes), accommodation channel number:ASSch is set to five, but. Reservation packets (8) do not fill the number of accommodation channel changes, and since there are no reservation packets to assign further, channel assignment is not performed.
[0059]Next in the time t12 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of a data packet (9), and RSVnew is 0, RSVbuf is 1 (reservation packets (8)), and since DLYmax is 4 (Step S11, Yes), accommodation channel number:ASSch is set to four. However, in a base station, since the communication finish time of a data packet (7) and the communication finish time of a data packet (8) which have already completed channel assignment will turn into the time if reservation packets (8) are chosen, channel assignment of a data packet (8) is not performed.
[0060]Finally in the time t13 shown in drawing 3, TRAFave is 3, RSVold is set to two with the end of communication of a data packet (6) and a data packet (7), RSVnew is 1 (reservation packets (10)), RSVbuf is 1 (reservation packets (8)), and since DLYmax is 5 (Step S11, Yes), accommodation channel number:ASSch is set to four. However, since the number of accommodation channel changes will become 2 in a base station if reservation packets (8) are chosen, Next reservation packets with a high priority (10) are chosen, at the time t14 of drawing 1, channel assignment of the transmission data packet (10) corresponding to reservation packets (10) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (10).
[0061]In a base station, ASSch is updated again after updating a packet priority table. At this time, TRAFave is 3 and RSVold is set to three with the end of communication of a data packet (6), and assignment of a data packet (10), RSVnew is 0, RSVbuf is 1 (reservation packets (8)) (Step S11, No), further, since DLYmax is 6, accommodation channel number:ASSch is set to four, but. Since reservation packets (8) are over DLYlim, irrespective of the number of accommodation packet change, channel assignment is performed and they perform packet transmission instruction further to the mobile station which transmitted reservation packets (8).
[0062]In the case of a transmission data packet, although this embodiment explained the case where a sound and a transmission data packet were intermingled, operation does not change, for example. Similarly, even when a transmission data packet and a packetized voice are intermingled, operation does not change. It may attach, when a transmission data packet and a packetized voice are intermingled, and the amount of maximum allowable delay for transmission data packets and the amount of maximum allowable delay for packetized voices may be divided and set up.
[0063]Thus, in the channel assignment method concerning this invention, Without change of the traffic by the call origination and clear back of a mobile station generating the rapid change of interference quantity used as a factor like before, channel assignment of a sound and a transmission data packet can be performed so that fixed communication quality can be maintained for example.
[0064]
[Effect of the Invention]As mentioned above, since a channel is assigned based on the average of the past accommodation channel number which is a statistical work result of the past communication traffic according to this invention as explained, the traffic change in a self-cell can be suppressed low. The effect that change of traffic like the conventional mobile communications system does not occur

by this is done so. In the conventional mobile communication system, line quality deteriorates until transmission power control is completed, but in the mobile communications system of this invention, since traffic change is suppressed low, the effect that the quality of a circuit does not deteriorate is done so. In the mobile communication system concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the effect that the power consumption is not consumed vainly is done so like before.

[0065]According to the next invention, since a channel is assigned based on the average of the past accommodation channel number which is a statistical work result of the past communication traffic, the traffic change in a self-cell can be suppressed low. The effect that change of traffic which was generated by the conventional channel assignment method does not occur by this is done so. In the conventional channel assignment method, line quality deteriorates, for example until transmission power control is completed, but in the channel assignment method of this invention, since traffic change is suppressed low, the effect that the quality of a circuit does not deteriorate is done so. In the channel assignment method concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the effect that the power consumption is not consumed vainly is done so like before.

[0066]Since a required channel number is determined from past line switching traffic and packet traffic according to the next invention, When the channel assignment demand more than an accommodation channel number occurs (i.e., when reservation packets are transmitted from a mobile station), the effect that a channel number and communication traffic can be held uniformly is done so by making the transmission data packet corresponding to the reservation packets stand by.

[0067]When the channel assignment demand more than an accommodation channel number occurs according to the next invention (i.e., when reservation packets are transmitted from a mobile station), The transmission data packet corresponding to the reservation packets is made to stand by, and let the values of an accommodation channel number be the past average channel number and a value of the sum of predetermined number:N (arbitrary constants determined by a system) further. At this time, it may determine for predetermined number:N to be good also as an accommodation channel number before assigning the transmission data packet corresponding to new-arrival reservation packets, or not to exceed a fixed rate of change with the quota channel number of a transmission data packet. The effect that channel assignment can be performed by this while suppressing change of traffic low is done so.

[0068]According to the next invention, since channel assignment is performed based on the data length of a packet, reduction of the channel number accompanying the end of data communications can be suppressed, and the effect that change of rapid traffic can be prevented by this is done so.

[0069]The final slot of the data length of the packet which performs channel assignment after this according to the next invention, Since the final slot of the data length of the packet already assigned to the channel checks directly and channel assignment is performed according to the identification result, reduction of the channel number accompanying the end of data communications can be suppressed to the minimum. The effect that change of rapid traffic can be prevented more powerfully by this is done so.

[0070]Therefore, according to this invention, without change of the traffic by the call origination and clear back of a mobile station generating the rapid change of interference quantity used as a factor, the mobile communications system which performs channel assignment of a sound and data can be provided so that fixed communication quality can be maintained.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]This invention relates to the channel assignment method of the sound in the mobile communications system which applied DS-CDMA, and data.
It is related with the channel assignment method in the radio between two or more base stations which constitute two or more radio area especially, and a mobile station.

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PRIOR ART

[Description of the Prior Art]Hereafter, the channel assignment method of the sound in the conventional radio and data (it is henceforth called a data packet) is explained. In the mobile communications system which applied DS-CDMA (Direct Sequence Code division multiple access). Two or more base stations constitute the communications area called a cell, and a mobile station and a base station generate a link by radio in the cell, and it communicates. In this mobile communications system, the radio signal (a sound and data) transmitted from two or more mobile stations is transmitted to a base station, for example.
[0003]The radio signal transmitted to these base stations is Eb/I0 (ratio of the signal power and interference power per bit). Maintaining at a constant level is dramatically important, The mobile communications system which applied DS-CDMA is a system that the line quality of other mobile stations deteriorates, when data is transmitted with the big electric power that Eb/I0 of one mobile station becomes good, for example. Therefore, in the mobile communications system which applied DS-CDMA, in order to keep constant Eb/I0 of the radio signal transmitted to a base station, transmission power control by each mobile station is performed, for example.
[0004]Drawing 8 for example, Literature RCS97-103 (Institute of Electronics, Information and Communication Engineers .). THE INSTITUTE OF ELECTRONICS, INFORMETION AND COMMUNICATION ENGINEERS. ; **** technique TECHNOCAL REPORT OF IBICE. It is the figure which is shown in SST97-64 and RCS97 103 (1997-09) and in which showing the outline of the conventional channel assignment method.
For example, channel assignment of the reservation packets (transmission data packet by a mobile station number) for every moving machine shown in drawing 9 is carried out [sound].

[0005]Drawing 8 shows the relation of the data packet and time-axis which were transmitted from two or more base stations. The conventional channel assignment methods shown here are a circuit switching system (voice communication) of a system, and a communications system with which the packet exchange system of a system and ** are intermingled at the time of ** instancy.
It is premised on using request-to-print-out-files assignment of packet channels especially at the time of transmission of a packet.
Let the number in each reservation packets in drawing 8 and drawing 9 be the individual number assigned for every mobile station.
[0006]In the channel assignment method of the conventional reservation packets, a base station gives a data packet transmission permission after fixed time to each mobile station which transmits each reservation packets, and each mobile station transmits a data packet at any time in response to this transmission permission as a graphic display shows. However, the number of mobile stations which transmits a data packet to a base station is restricted as a base station gives delay directions and shows drawing 8 to the mobile station which transmits those reservation packets, when an accommodation channel number exceeds the predetermined capacity limit decided by Eb/I0 at this time. Speaking concretely, delaying the corresponding data packet by drawing 8 by giving delay directions to the 5th mobile station as an arrow.
[0007]It generates with the conventional mobile communications system, for example, about change of the traffic by the call origination and clear back of a mobile station, to each mobile station, a base

station transmits transmission power changing instruction, and is performing transmission power control with each mobile station each time. Thus, in the channel assignment method in the conventional radio. By restricting the transmission power control by each above-mentioned mobile station, and the number of mobile stations which transmits packet data, it is communicating so that a sound and data can maintain fixed quality, namely, so that Eb/I0 can be maintained at a constant level.

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EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, since a channel is assigned based on the average of the past accommodation channel number which is a statistical work result of the past communication traffic according to this invention as explained, the traffic change in a self-cell can be suppressed low. The effect that change of traffic like the conventional mobile communications system does not occur by this is done so. In the conventional mobile communication system, line quality deteriorates until transmission power control is completed, but in the mobile communications system of this invention, since traffic change is suppressed low, the effect that the quality of a circuit does not deteriorate is done so. In the mobile communication system concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the effect that the power consumption is not consumed vainly is done so like before.
[0065]According to the next invention, since a channel is assigned based on the average of the past accommodation channel number which is a statistical work result of the past communication traffic, the traffic change in a self-cell can be suppressed low. The effect that change of traffic which was generated by the conventional channel assignment method does not occur by this is done so. In the conventional channel assignment method, line quality deteriorates, for example until transmission power control is completed, but in the channel assignment method of this invention, since traffic change is suppressed low, the effect that the quality of a circuit does not deteriorate is done so. In the channel assignment method concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the effect that the power consumption is not consumed vainly is done so like before.
[0066]Since a required channel number is determined from past line switching traffic and packet traffic according to the next invention, When the channel assignment demand more than an accommodation channel number occurs (i.e., when reservation packets are transmitted from a mobile station), the effect that a channel number and communication traffic can be held uniformly is done so by making the transmission data packet corresponding to the reservation packets stand by.
[0067]When the channel assignment demand more than an accommodation channel number occurs according to the next invention (i.e., when reservation packets are transmitted from a mobile station), The transmission data packet corresponding to the reservation packets is made to stand by, and let the values of an accommodation channel number be the past average channel number and a value of the sum of predetermined number:N (arbitrary constants determined by a system) further. At this time, it may determine for predetermined number:N to be good also as an accommodation channel number before assigning the transmission data packet corresponding to new-arrival reservation packets, or not to exceed a fixed rate of change with the quota channel number of a transmission data packet. The effect that channel assignment can be performed by this while suppressing change of traffic low is done so.
[0068]According to the next invention, since channel assignment is performed based on the data length of a packet, reduction of the channel number accompanying the end of data communications can be suppressed, and the effect that change of rapid traffic can be prevented by this is done so.
[0069]The final slot of the data length of the packet which performs channel assignment after this according to the next invention, Since the final slot of the data length of the packet already assigned to the channel checks directly and channel assignment is performed according to the identification

result, reduction of the channel number accompanying the end of data communications can be suppressed to the minimum. The effect that change of rapid traffic can be prevented more powerfully by this is done so.

[0070]Therefore, according to this invention, without change of the traffic by the call origination and clear back of a mobile station generating the rapid change of interference quantity used as a factor, the mobile communications system which performs channel assignment of a sound and data can be provided so that fixed communication quality can be maintained.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, as for the above and change of the traffic generated with the conventional mobile communications system, a rapid change of interference quantity may be brought about (change of the time t8 of drawing 8, etc.). And in a base station, transmission power changing instruction is transmitted to each mobile station so that the received power from each mobile station may become fixed. In such a case, in each mobile station, since the transmission power variation by one-time transmission-power-control directions had restriction, change of this rapid traffic had a problem that transmission power control could not be followed.
[0009]When it was the same as that of the above, even if it was a case where transmission power control was performed by each mobile station, there was a problem that line quality deteriorated for example, until transmission power control is completed.
[0010]Since transmission power was increased by many mobile stations at the time of interference generating accompanying the increase of traffic in the conventional channel assignment method, there was a problem that the power consumption will be consumed vainly.
[0011]This invention was made in view of the above, and is ****. Without change of the traffic by the call origination and clear back of ** generating the rapid change of interference quantity used as a factor, the purpose so that fixed communication quality can be maintained, It is obtaining the channel assignment method of the data in the mobile communications system which can perform channel assignment of a sound and data, and its system.

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MEANS

[Means for Solving the Problem]If it is in a mobile communications system concerning this invention in order to solve a technical problem mentioned above and to attain the purpose, Two or more base stations (equivalent to the base station 101 of an embodiment mentioned later), and two or more mobile stations (equivalent to the mobile stations 1-10) connected to these base stations via a wireless circuit, A sound and data are assigned to each channel according to this accommodation channel number by determining that an accommodation channel number will suppress traffic change in a self-cell based on communication traffic of a preparation and the past (refer to drawing 1).
[0013]According to this invention, since a channel is assigned based on an average of the past accommodation channel number which is a statistical work result of the past communication traffic, traffic change in a self-cell can be suppressed low. Thereby, change of traffic like the conventional mobile communications system does not occur. In the conventional mobile communication system, line quality deteriorates, for example until transmission power control is completed, but in a mobile communications system of this invention, since traffic change is suppressed low, quality of a circuit does not deteriorate. In a mobile communication system concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the power consumption will not necessarily be vainly consumed like before.
[0014]If it is in a channel assignment method concerning the next invention, By determining that an accommodation channel number will suppress traffic change in a self-cell based on the past communication traffic, A channel assignment step (equivalent to Step S1 of an embodiment mentioned later - Step S8, Step S11 - Step S14, Step S21 - Step S26) which assigns a sound and data to each channel according to this accommodation channel number is included.
[0015]According to this invention, since a channel is assigned based on an average of the past accommodation channel number which is a statistical work result of the past communication traffic, traffic change in a self-cell can be suppressed low. Thereby, change of traffic which was generated by the conventional channel assignment method does not occur. In a conventional channel assignment method, line quality deteriorates, for example until transmission power control is completed, but in a channel assignment method of this invention, since traffic change is suppressed low, quality of a circuit does not deteriorate. In a channel assignment method concerning this invention, since traffic change is suppressed low, transmission power is not increased by many mobile stations, and the power consumption will not necessarily be vainly consumed like before.
[0016]In a channel assignment method concerning the next invention, said channel assignment step, By determining an accommodation channel number from past line switching traffic and packet traffic which are said communication traffic, and delaying this packet further, when a channel assignment demand more than this channel number occurs, A delay step (equivalent to Step S3 - Step S5 of an embodiment which are mentioned later) holding a fixed channel number is included.
[0017]Since a required channel number is determined from past line switching traffic and packet traffic according to this invention, When a channel assignment demand more than an accommodation channel number occurs (i.e., when reservation packets are transmitted from a mobile station), a channel number and communication traffic can be uniformly held by making a transmission data packet corresponding to the reservation packets stand by.
[0018]In a channel assignment method concerning the next invention, said channel assignment step,

When holding said channel number uniformly and said packet exceeds a predetermined delaying amount, an increase step in a channel (equivalent to Step S11 of an embodiment mentioned later, Step S13, and Step S14) which increases a channel number to assign is included.
[0019]When a channel assignment demand more than an accommodation channel number occurs according to this invention (i.e., when reservation packets are transmitted from a mobile station), A transmission data packet corresponding to the reservation packets is made to stand by, and let values of an accommodation channel number be the past average channel number and a value of the sum of predetermined number:N (arbitrary constants determined by a system) further. At this time, it may determine for predetermined number:N to be good also as an accommodation channel number before assigning a transmission data packet corresponding to new-arrival reservation packets, or not to exceed a fixed rate of change with a quota channel number of a transmission data packet. Thereby, channel assignment can be performed, suppressing change of traffic low.
[0020]In a channel assignment method concerning the next invention, said channel assignment step, Data length of a packet, and past line switching traffic and packet traffic which are said communication traffic, Based on an accommodation channel number ** determined, assign a sound and data to each channel according to this accommodation channel number, and further, at the time of an end of data communications, so that a rapid change of a channel number or traffic may not occur, Channel assignment of a sound and data is performed (equivalent to Step S7 of an embodiment mentioned later).
[0021]According to this invention, since channel assignment is performed based on data length of a packet, reduction of a channel number accompanying an end of data communications can be suppressed, and, thereby, change of rapid traffic can be prevented.
[0022]In a channel assignment method concerning the next invention, said channel assignment step, Based on data length of a packet which will assign a channel from now on, and data length of a packet already assigned to a channel, by performing channel assignment of a sound and data, Change of a rapid channel number generated at the time of an end of data communications is controlled (equivalent to Step S7 of an embodiment mentioned later).
[0023]A final slot of data length of a packet which performs channel assignment after this according to this invention, Since a final slot of data length of a packet already assigned to a channel checks directly and channel assignment is performed according to the identification result, reduction of a channel number accompanying an end of data communications can be suppressed to the minimum. Thereby, change of rapid traffic can be prevented more powerfully.
[0024]
[Embodiment of the Invention]Below, the embodiment of the channel assignment method of the data in the mobile communications system concerning this invention and its system is described in detail based on a drawing. This invention is not limited by this embodiment.
[0025]Drawing 1 shows the channel assignment result of the sound and data (it is henceforth called the transmission data packet) based on the mobile communications system which realizes the channel assignment method concerning this invention. This channel assignment result is the result of assigning a channel between the base station 101 which constitutes a communications area as shown in drawing 2, for example, each mobile station (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), and **.
[0026]Hereafter, the channel assignment method concerning this invention is explained concretely. First, drawing 3 shows the state where the reservation packets from two or more mobile stations as shown in drawing 2 arrived to the base station at random, for example, shows each of those reservation packets on the basis of a time-axis. Drawing 4 shows typically the packet length of each transmission data packet contained in the reservation packets shown in drawing 3 as information.
[0027]When those reservation packets are transmitted by the random access channel, two or more reservation packets may arrive at a base station simultaneously, for example as a graphic display (equivalent to the time t0 and t7). The number of the reservation packets in drawing 2 expresses the classification (equivalent to the mobile station 1 - the mobile station 10 which are shown in drawing 2) of each mobile station. In this embodiment, a channel shows the channel realized by the spread code in a DS-SDMA method. It is not necessary to necessarily transmit reservation packets per slot in each mobile station, and is still better also as transmitting to a base station using channels other than a random access channel.

[0028]Drawing 5 shows the flow chart of the concrete channel assignment method performed with the mobile communications system of this invention. In the channel assignment method concerning this invention. Instancy with the circuit switching system (voice communication) of a system, and the communications system with which the packet exchange system of a system and ** are intermingled at the time of **. As it is premised on using request-to-print-out-files assignment of packet channels especially and is further shown in drawing 1, Two voice communications are already assigned using said circuit switching system, the data packet x1 and x2 are assigned before the time t1, and it is premised on the case where the past average accommodation channel number is 4. [finishing / channel assignment]

[0029]For example, in the time t0 shown in drawing 3, the value of suspended number of reservation packets:RSVbuf or more in one. Or when the value of number of new-arrival reservation packets:RSVnew from each mobile station is one or more (Step S1, Yes), a priority is given to the reservation packets suspended before the time t0, and the packet priority table which a base station has is updated (Step S2). When number of reservation packets:RSVbuf suspended before the time t0 is 0 at this time, a priority will be the highest for the reservation packets transmitted from a mobile station in the time t0.

[0030]On the other hand, when the value of both number of reservation packets:RSVbuf suspended before the time t0 and number of new-arrival reservation packets:RSVnew is 0 (Step S1, No), channel assignment of a transmission data packet is not performed (end). However, a base station performs weighting for the packet length information on the send data contained in the reservation packets which a mobile station transmits to a basis and each reservation packets, and is good also as creating a packet priority table based on the eclipse ********** with dignity. The number of the mobile station with which the priority of reservation packets is set up beforehand. (for example, considerable from 1 of drawing 3 to 10) For example, it is good also as determining by the priority number included in reservation packets, or good also as determining that change of the accommodation channel number at the time of the end of a telephone call will become the smallest.

[0031]Next, in a base station, a transmission data packet, the sound of a line switching, and accommodation [** and others] channel number:ASSch are updated (Step S3). Here, the updating method of accommodation channel number:ASSch is explained in detail according to drawing 6.

[0032](For example, the past average traffic (here), i.e., average accommodation channel number:TRAFave before [a channel assignment time to] T hour) it is previously defined as 4 -- **** -- with number of new-arrival reservation packets:RSVnew. When larger than channel number:RSVold already assigned in the following slot, and the sum of suspended number of reservation packets:RSVbuf (Step S11, Yes), as for the value of accommodation channel number:ASSch, the value of TRAFave is assigned as it is (Step S12). When TRAFave does not become an integer from the channel assignment time in the average before T hour, it is better also considering the integer large nearest to an average channel number as TRAFave than considering the value which omitted below the decimal point, or an average channel number.

[0033]In the case (Step S11, No) where TRAFave is smaller than the sum of RSVnew, RSVold, and RSVbuf on the other hand, The transmission permission delay value of the transmission data packet corresponding to the reservation packets concerned : the value of Tbuf, Transmission permission maximum delay time of the transmission data packet corresponding to the suspension reservation packets concerned : in the case where it is smaller than DLYmax. Or the product of TRAFave and Tbuf is a Request-to-Send data packet total of all the new-arrival reservation packets :P new, Request-to-Send data packet total of suspension reservation packets :P When smaller than the sum with buf (Step S13, Yes), the value of accommodation channel number:ASSch assigns the value of the sum of TRAFave and predetermined number:N (arbitrary constants determined by a system) (Step S14).

[0034]And in the case (Step S11, No) where TRAFave is smaller than the sum of RSVnew, RSVold, and RSVbuf, The value of Tbuf is larger than DLYmax, and when the product of TRAFave and Tbuf is still larger than the sum of Pnew and Pbuf (Step S13, No), as for the value of accommodation channel number:ASSch, the value of TRAFave is assigned as it is (Step S12).

[0035]It may determine for the above-mentioned predetermined number:N to be good also as an accommodation channel number before assigning the transmission data packet corresponding to new-arrival reservation packets, or not to exceed a fixed rate of change with the quota channel number of a

transmission data packet. When determining not to exceed the fixed rate of change which has a quota channel number of a transmission data packet in N, it is good also as making the rate of change into ten percent, and, for example, Or it is good also as a value that change of interference quantity is set to less than 1 dB, or good also as a difference of ASSch and RSVold.
[0036]Thus, after updating accommodation channel number:ASSch (Step S3) in a base station. When ASSch and RSVold which were updated are compared (step S4) and RSVold is less than ASSch (step S4, No), Channel assignment of the transmission data packet corresponding to the reservation packets concerned is performed, packet transmission instruction is performed to the mobile station which corresponds when channel assignment is possible (Step S6, Yes) (Step S7), and a packet priority table is updated again (Step S2). When channel assignment is impossible (Step S6, No), it ends without performing channel assignment.
[0037]On the other hand, in the comparison in step S4, when RSVold is more than ASSch (step S4, Yes), standby directions are performed to the mobile station corresponding to the reservation packets concerned (Step S5).
[0038]Here, the channel assignment method in Step S6 is explained in detail according to drawing 7. First, for example, reservation packets with the highest priority are chosen out of the packet priority table updated beforehand (Step S21). Ask for the number of change of the accommodation channel by assigning selected reservation packets, and And the number of change of this accommodation channel, Comparison with the number C of accommodation channel acceptable variations set up beforehand is performed (Step S22), for example, when the number of accommodation channel changes is below C (Step S22, Yes), channel assignment of the transmission data packet corresponding to selected reservation packets is performed (Step S23). Also when delaying amount:DLYmax of reservation packets with the highest priority exceeds reservation-packets maximum delay permitted amount:DLYlim set up beforehand in comparison of Step S22 (Step S22, YES), Channel assignment of the transmission data packet corresponding to reservation packets with the highest priority is performed (Step S23).
[0039]On the other hand, in comparison of Step S22, when said number of accommodation channel changes is larger than C (Step S22, No), reservation packets with a high priority are chosen next from the packet priority tables updated beforehand (Step S24). And the number of reservation packets from the one where the priority decided [reselecting beforehand and] is higher to the reservation packets which can be reselected, Predetermined number: Compare L (Step S25), ask for the number of accommodation channel changes by assigning the reselected reservation packets, when the number of reservation packets which can be reselected is below L (Step S25, Yes), and perform comparison with the rate of an accommodation channel change, and C again (Step S22). The value of C is good also as a fixed value set up beforehand. Or it is good also as a value which can be found from the rate corresponding to an accommodation channel number. The number of accommodation channel changes may include the accommodation channel change not only accompanying change produced by assigning reservation packets but the end of communication of the already accommodated channel.
[0040]In comparison of Step S25, when the reselected number of reservation packets is larger than L, or when there are no reservation packets to choose (Step S25, No), channel assignment is not performed (Step S26).
[0041]Below, the case where the transmission data packet (refer to drawing 4) corresponding to the reservation packets of drawing 3 is assigned is actually explained in accordance with drawing 5, drawing 6, and the channel assignment method of drawing 7. When the value of T is made into 2 packet-slots length, for example, an average channel number cannot be accepted here, The integer small nearest to an average channel number is set to TRAFave from an average channel number, 1 and maximum delay permitted amount:DLYlim of reservation packets for the number L of reservation packets which can be reselected [1 and] 5 packet length, [the value of Tbuf] [the value of the past of 2 and TRAFave] [4 and the rate C of a permission accommodation channel change] Predetermined number: Explain channel assignment operation when the reservation packets of drawing 2 arrive at a base station, assuming N to be 1.
[0042]When a base station receives reservation packets, a base station, After fixed delay, packet transmission instruction (Step S8 of drawing 5) and standby directions (Step S5 of drawing 5) shall be performed, and a mobile station shall also transmit a transmission data packet after fixed delay in

response to the packet transmission instruction concerned and standby directions further. Here, let transmission delay time of a mobile station and a base station be 1 packet-slots length, for example.
[0043]Therefore, corresponding to the reservation packets which the mobile station transmitted, in a base station, packet transmission instruction is given after 1 packet-slots length, and it is 1 also with after that and a mobile station. A transmission data packet will be transmitted after packet-slots length. In this embodiment, even when not performing standby directions, it is good also as standby directions to have not taking out directions from a base station to a mobile station. The transmission delay time of a mobile station and a base station may be longer than 1 packet-slots length, and is not this limitation.
[0044]First, in the time t1 shown in drawing 3, there are no reservation packets suspended before the time t0, Since TRAFave is 4, RSVold is 2, RSVnew is 2 (reservation packets (1), reservation packets (2)) and RSVbuf is 0 (Step S11, Yes), accommodation channel number:ASSch is 4. Therefore, at the time t2 of drawing 1, a base station performs channel assignment of a transmission data packet (1) and a transmission data packet (2), and performs packet transmission instruction further here to the mobile station which transmitted reservation packets (1) and reservation packets (2).
[0045]Next in the time t2 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 1 (reservation packets (3)), RSVbuf is 0 (Step S11, No), and DLYmax is 0 further, The product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 5, and since Pbuf is 0 (Step S13, No), accommodation channel number:ASSch is set to four and performs suspension directions in a base station to the mobile station which transmitted reservation packets (3).
[0046]Next in the time t3 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 1 (reservation packets (4)), RSVbuf is 1 (reservation packets (3)) (Step S11, No), DLYmax is 1 (reservation packets (3)) and the product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 4, and since Pbuf is 5 (Step S13, No), accommodation channel number:ASSch is set to four and performs suspension directions in a base station to the mobile station which transmitted reservation packets (4).
[0047]Next in the time t4 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 0 -- RSVbuf -- two (reservation packets (3).) It is reservation packets (4) (Step S11, No), and DLYmax is 2 (reservation packets (3)) further, The product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 0, and since Pbuf is 9 (Step S13, No), accommodation channel number:ASSch is set to four and directs nothing in a base station.
[0048]Next in the time t5 shown in drawing 3, TRAFave is 4, Since a data packet (1) is completed, RSVold is 3, and RSVnew is 1 (reservation packets (5)), RSVbuf is 2 (reservation packets (3), reservation packets (4)) (Step S11, No), The product of TRAFave (=4) and Tbuf (=3) is 12, DLYmax is 3 (reservation packets (3)), Pnew is 3, and since Pbuf is 9 (Step S13, Yes), accommodation channel number:ASSch is set to five. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t6 of drawing 1, for example. Channel assignment of the transmission data packet (3) corresponding to reservation packets (3) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (3).
[0049]The transmission data packet corresponding to reservation packets (4) which is next reservation packets with a high priority is received, TRAFave is 4, RSVold is 4 and RSVnew is 0, RSVbuf is 2 (reservation packets (4), reservation packets (5)) (Step S11, No), DLYmax is 2 (reservation packets (4)) and the product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 0, and since Pbuf is 7 (Step S13, No), accommodation channel number:ASSch is set to four and directs nothing in a base station. That is, assignment of a new channel is not performed.
[0050]Next in the time t6 shown in drawing 3, TRAFave is 4, RSVold is 4 and RSVnew is 0 -- RSVbuf -- two (reservation packets (4).) It is reservation packets (5) (Step S11, No), and DLYmax is 3 (reservation packets (4)) further, The product of TRAFave (=4) and Tbuf (=3) is 12, Pnew is 0, and since Pbuf is 7 (Step S13, Yes), accommodation channel number:ASSch is set to five.
[0051]If a priority is determined as the arrival order of reservation packets in a base station at this time, although a priority becomes high from reservation packets (5), reservation packets (4), Since the communication finish time of a data packet (3) and the communication finish time of a data packet (4) which have already completed channel assignment will turn into the time if reservation packets (4) are chosen, change of an accommodation channel number gives priority to and chooses fewer reservation

packets (5). . Therefore, in a base station, change of an accommodation channel number is fewer reservation packets at the time t7 of drawing 1, for example. Channel assignment of the transmission data packet (5) corresponding to reservation packets (5) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (5).
[0052]Next, in the time t7 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of one voice communication, and since RSVnew is 0 (Step S11, Yes), accommodation channel number:ASSch is set to four. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t8 of drawing 1, for example. Channel assignment of the transmission data packet (4) corresponding to reservation packets (4) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (4).
[0053]Next in the time t8 shown in drawing 3, TRAFave is 4, RSVold is 4, RSVnew is 3 and RSVbuf is 0 (Step S11, No), The product of TRAFave (=4) and Tbuf (=3) is 12, DLYmax is 0, Pnew is 10, and since Pbuf is 0 (Step S13, No), accommodation channel number:ASSch is set to four and directs nothing in a base station. That is, assignment of a new channel is not performed.
[0054]Next in the time t9 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of the data packet 5, and RSVnew is 0, RSVbuf is 3 (reservation packets (6), reservation packets (7), reservation packets (8)) (Step S11, No), The product of TRAFave (=4) and Tbuf (=3) is 12, DLYmax is 1, Pnew is 0, and since Pbuf is 10 (Step S13, No), accommodation channel number:ASSch is set to four. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t10 of drawing 1, for example. Channel assignment of the transmission data packet (6) corresponding to reservation packets (6) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (6).
[0055]Next in the time t10 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of a data packet (3), and RSVnew is 0, RSVbuf is 2 (reservation packets (7), reservation packets (8)) (Step S11, No), The product of TRAFav (=4) and Tbuf (=3) is 12, DLYmax is 2, Pnew is 0, and since Pbuf is 10 (Step S13, No), accommodation channel number:ASSch is set to four. . Therefore, in a base station, they are priority Dibble's reservation packets with the highest priority at the time t11 of drawing 1, for example. Channel assignment of the transmission data packet (7) corresponding to reservation packets (7) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (7).
[0056]Next in the time t11 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of a data packet (4), and RSVnew is 1 (reservation packets (9)), RSVbuf is 1 (reservation packets (8)) (Step S11, No), and further, since DLYmax is 3 (Step S13, Yes), accommodation channel number:ASSch is set to five.
[0057]If a priority is determined as the arrival order of reservation packets in a base station at this time, although a priority becomes high from reservation packets (9), reservation packets (8), Since the communication finish time of a data packet (6) and the communication finish time of a data packet (8) which have already completed channel assignment will turn into the time if reservation packets (8) are chosen, change of an accommodation channel number gives priority to and chooses fewer reservation packets (9). . Therefore, in a base station, change of an accommodation channel number is fewer reservation packets at the time t12 of drawing 1, for example. Channel assignment of the transmission data packet (9) corresponding to reservation packets (9) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (9).
[0058]In a base station, ASSch is updated again after updating a packet priority table. At this time, TRAFave is 4 and RSVold is set to four with the end of communication of a data packet (4), and assignment of a data packet (9), RSVnew is 0, RSVbuf is 1 (reservation packets (8)) (Step S11, No), further, since DLYmax is 4 (Step S13, Yes), accommodation channel number:ASSch is set to five, but. Reservation packets (8) do not fill the number of accommodation channel changes, and since there are no reservation packets to assign further, channel assignment is not performed.
[0059]Next in the time t12 shown in drawing 3, TRAFave is 4, RSVold is set to three with the end of communication of a data packet (9), and RSVnew is 0, RSVbuf is 1 (reservation packets (8)), and since DLYmax is 4 (Step S11, Yes), accommodation channel number:ASSch is set to four. However, in a base

station, since the communication finish time of a data packet (7) and the communication finish time of a data packet (8) which have already completed channel assignment will turn into the time if reservation packets (8) are chosen, channel assignment of a data packet (8) is not performed.
[0060]Finally in the time t13 shown in drawing 3, TRAFave is 3, RSVold is set to two with the end of communication of a data packet (6) and a data packet (7), RSVnew is 1 (reservation packets (10)), RSVbuf is 1 (reservation packets (8)), and since DLYmax is 5 (Step S11, Yes), accommodation channel number:ASSch is set to four. However, since the number of accommodation channel changes will become 2 in a base station if reservation packets (8) are chosen, Next reservation packets with a high priority (10) are chosen, at the time t14 of drawing 1, channel assignment of the transmission data packet (10) corresponding to reservation packets (10) is performed, and packet transmission instruction is further performed to the mobile station which transmitted reservation packets (10).
[0061]In a base station, ASSch is updated again after updating a packet priority table. At this time, TRAFave is 3 and RSVold is set to three with the end of communication of a data packet (6), and assignment of a data packet (10), RSVnew is 0, RSVbuf is 1 (reservation packets (8)) (Step S11, No), further, since DLYmax is 6, accommodation channel number:ASSch is set to four, but. Since reservation packets (8) are over DLYlim, irrespective of the number of accommodation packet change, channel assignment is performed and they perform packet transmission instruction further to the mobile station which transmitted reservation packets (8).
[0062]In the case of a transmission data packet, although this embodiment explained the case where a sound and a transmission data packet were intermingled, operation does not change, for example. Similarly, even when a transmission data packet and a packetized voice are intermingled, operation does not change. It may attach, when a transmission data packet and a packetized voice are intermingled, and the amount of maximum allowable delay for transmission data packets and the amount of maximum allowable delay for packetized voices may be divided and set up.
[0063]Thus, in the channel assignment method concerning this invention, Without change of the traffic by the call origination and clear back of a mobile station generating the rapid change of interference quantity used as a factor like before, channel assignment of a sound and a transmission data packet can be performed so that fixed communication quality can be maintained for example.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a figure showing the channel assignment result of the sound and data based on the mobile communications system which realizes the channel assignment method concerning this invention.
[Drawing 2]It is a figure showing the composition of a mobile communications system.
[Drawing 3]The reservation packets from two or more mobile stations are the figures showing the state where it arrived to the base station at random.
[Drawing 4]It is a figure showing typically the packet length of each transmission data packet contained in reservation packets as information.
[Drawing 5]It is a flow chart which shows the concrete channel assignment method performed with the mobile communications system of this invention.
[Drawing 6]Accommodation channel number: It is a flow chart which shows the updating method of ASSch.
[Drawing 7]It is a flow chart which shows the concrete channel assignment method.
[Drawing 8]It is a figure showing the sound by the conventional mobile communications system, and the channel assignment result of data.
[Drawing 9]It is a figure showing typically the packet length of each transmission data packet contained in reservation packets as information.
[Description of Notations]
101 A base station, and 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 Mobile station.

[Translation done.]

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(71)出願人　000006013
三菱電機株式会社
東京都千代田区丸の内二丁目２番３号
(72)発明者　相川　秀斗
東京都千代田区丸の内二丁目２番３号　三菱電機株式会社内
(72)発明者　渋谷　昭宏
東京都千代田区丸の内二丁目２番３号　三菱電機株式会社内
(74)代理人　100089118
弁理士　酒井　宏明　（外１名）

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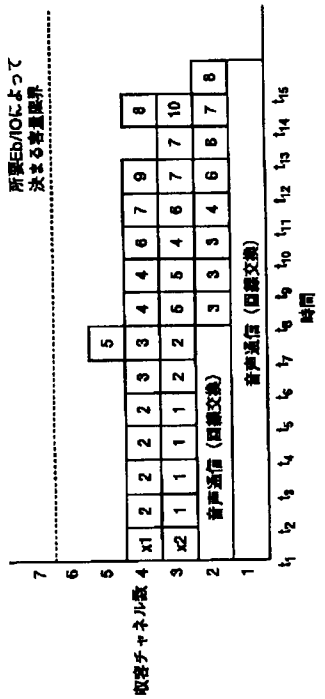
(54)【発明の名称】　移動体通信システム、およびそのシステムにおけるデータのチャネル割り当て方法

(57)【要約】
【課題】　移動局の発呼や終話によるトラヒックの変動が要因となる、干渉量の急激な変動を発生させることなく、一定の通信品質を保てるように音声およびデータのチャネル割り当てを行うことができる移動体通信システムを得ること。
【解決手段】　複数の基地局と、これらの基地局に無線回線を介して接続される複数の移動局と、を備える移動体通信システムにおいて、過去の通信トラヒックに基づいて、自セル内のトラヒック変動を抑えるように収容チャネル数を決定することにより、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当てることを特徴とする。



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【特許請求の範囲】

【請求項１】　複数の基地局と、これらの基地局に無線回線を介して接続される複数の移動局と、を備える移動体通信システムにおいて、

過去の通信トラヒックに基づいて、自セル内のトラヒック変動を抑えるように収容チャネル数を決定することにより、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当てることを特徴とする移動体通信システム。

【請求項２】　複数の基地局と、これらの基地局に無線回線を介して接続される複数の移動局と、を備える移動体通信システムにおける音声およびデータのチャネル割り当て方法において、

過去の通信トラヒックに基づいて、自セル内のトラヒック変動を抑えるように収容チャネル数を決定することにより、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当てるチャネル割り当てステップ、を含むことを特徴とする移動体通信システムにおける音声およびデータのチャネル割り当て方法。

【請求項３】　前記チャネル割り当てステップは、前記通信トラヒックである、過去の回線交換トラヒックおよびパケットトラヒックから収容チャネル数を決定し、さらに、該チャネル数以上のチャネル割り当て要求が発生する場合、該パケットを遅延させることにより、一定のチャネル数を保持する遅延ステップ、を含むことを特徴とする請求項２に記載の移動体通信システムにおける音声およびデータのチャネル割り当て方法。

【請求項４】　前記チャネル割り当てステップは、前記チャネル数を一定に保持する場合において、前記パケットが所定の遅延量を超えるとき、割り当てるチャネル数を増やすチャネル増加ステップ、を含むことを特徴とする請求項３に記載の移動体通信システムにおける音声およびデータのチャネル割り当て方法。

【請求項５】　前記チャネル割り当てステップは、パケットのデータ長と、前記通信トラヒックである、過去の回線交換トラヒックやパケットトラヒックと、から決定する収容チャネル数に基づいて、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当て、さらに、データ通信終了時に、チャネル数またはトラヒックの急激な変動が発生しないように、音声およびデータのチャネル割り当てを行うことを特徴とする請求項２～４のいずれか一つに記載の移動体通信システムにおける音声およびデータのチャネル割り当て方法。

【請求項６】　前記チャネル割り当てステップは、これからチャネルの割り当てを行うパケットのデータ長と、既にチャネルに割り当てられているパケットのデータ長に基づいて、音声およびデータのチャネル割り当てを行うことにより、データ通信終了時に発生する急激なチャネル数の変動を抑制することを特徴とする請求項２～５のいずれか一つに記載の移動体通信システムにおける音声およびデータのチャネル割り当て方法。

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【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ＤＳ－ＣＤＭＡを適用した移動体通信システムにおける音声およびデータのチャネル割り当て方法に関するものであり、特に、複数の無線通信エリアを構成する複数の基地局および移動局間の、無線通信におけるチャネル割り当て方法に関するものである。

【０００２】

【従来の技術】以下、従来の無線通信における音声およびデータ（以後、データパケットと呼ぶ）のチャネル割り当て方法について説明する。ＤＳ－ＣＤＭＡ(Direct Sequence Code division multiple access) を適用した移動体通信システムでは、複数の基地局がセルと呼ばれる通信エリアを構成して、そのセルにおいて移動局および基地局が無線によりリンクを生成し、そして、通信を行う。この移動体通信システムでは、たとえば、複数の移動局から送信される無線信号（音声およびデータ）が基地局に送信される。

【０００３】これら基地局に送信される無線信号は、Ｅｂ／Ｉ０(ビットあたりの信号電力と干渉電力の比) を一定レベルに保つことが非常に重要であり、ＤＳ－ＣＤＭＡを適用した移動体通信システムは、たとえば、１つの移動局のＥｂ／Ｉ０が良くなるような大電力でデータを送信すると、他の移動局の回線品質が劣化するようなシステムである。そのため、ＤＳ－ＣＤＭＡを適用した移動体通信システムでは、基地局に送信される無線信号のＥｂ／Ｉ０を、一定に保つために、たとえば、各移動局による送信電力制御が行われている。

【０００４】図８は、たとえば、文献ＲＣＳ９７－１０３（電子情報通信学会 THE INSTITUTE OF ELECTRONICS, INFORMETION AND COMMUNICATION ENGINEERS ;信学技法 TECHNOCAL REPORT OF IBICE SST97-64,RCS97 103(1997-09)）に示されている、従来のチャネル割り当て方法の概略を示した図であり、たとえば、図９に示す移動機毎の予約バケット（移動局番号による送信データバケット）を、音声とともにチャネル割り当てしたものである。

【０００５】なお、図８は、複数の基地局から送信されたデータバケットと時間軸との関係を示している。また、ここに示す従来のチャネル割り当て方法は、即時系の回線交換方式（音声通信）と、待時系のバケット交換方式と、が混在する通信システムであり、特に、バケットの伝送時は、バケットチャネルの予約割当てを用いることを前提としている。また、図８および図９における各予約バケット内の数字は、移動局毎に割り振られた個別の番号とする。

【０００６】図示からわかるとおり、従来の予約バケットのチャネル割り当て方法では、各予約バケットを送信

する各移動局に対して、基地局が一定時間後にデータバケット送信許可を与え、この送信許可を受けて、各移動局が随時データバケットを送信する。ただし、このとき、収容チャネル数がＥｂ／Ｉ０によって決まる所定の容量限界を超える場合には、基地局が、その予約バケットを送信する移動局に対して、遅延指示を与え、図８に示すとおり、基地局へデータバケットを送信する移動局数を制限している。具体的にいうと、図８では、５番目の移動局に対して、遅延指示を与えることにより、対応するデータバケットを、矢印のとおりに、遅延させている。

【０００７】なお、従来の移動体通信システムにて発生する、たとえば、移動局の発呼や終話によるトラヒックの変動については、基地局が、その都度、各移動局に対して、送信電力変更指示を送信し、各移動局で送信電力制御を行っている。このように、従来の無線通信におけるチャネル割り当て方法では、上記各移動局による送信電力制御、およびバケットデータを送信する移動局数の制限を行うことにより、音声およびデータが一定の品質を保てるように、すなわち、Ｅｂ／Ｉ０を一定レベルに保てるように、通信を行っている。

【０００８】

【発明が解決しようとする課題】しかしながら、上記、従来の移動体通信システムにて発生するトラヒックの変動は、干渉量の急激な変動をもたらす場合（図８の時間ｔ８の変動等）がある。そして、基地局においては、各移動局からの受信電力が一定になるように、各移動局に対して送信電力変更指示を送信する。このような場合、各移動局では、一度の送信電力制御指示による送信電力変化量に制限があるため、この急激なトラヒックの変動に、送信電力制御が追従しきれない、という問題があった。

【０００９】また、上記と同様の場合において、各移動局により送信電力制御が行われる場合であっても、たとえば、送信電力制御が完了するまでの間は、回線品質が劣化する、という問題があった。

【００１０】さらに、従来のチャネル割り当て方法における、トラヒックの増大に伴う干渉発生時には、多くの移動局により送信電力が増加されるため、その消費電力が無駄に消費されてしまう、という問題があった。

【００１１】本発明は、上記に鑑みてなされたものであって、移動局の発呼や終話によるトラヒックの変動が要因となる、干渉量の急激な変動を発生させることなく、一定の通信品質を保てるように、音声およびデータのチャネル割り当てを行うことができる移動体通信システム、およびそのシステムにおけるデータのチャネル割り当て方法を得ることを目的とする。

【００１２】

【課題を解決するための手段】上述した課題を解決し、目的を達成するために、本発明にかかる移動体通信システムにあっては、複数の基地局（後述する実施の形態の基地局１０１に相当）と、これらの基地局に無線回線を介して接続される複数の移動局（移動局１から１０に相当）と、を備え、過去の通信トラヒックに基づいて、自セル内のトラヒック変動を抑えるように収容チャネル数を決定することにより、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当てることを特徴とするものである（図１参照）。

【００１３】この発明によれば、過去の通信トラヒックの統計処理結果である、たとえば、過去の収容チャネル数の平均に基づいて、チャネルを割り当てるため、自セル内のトラヒック変動を低く抑えることができる。これにより、従来の移動体通信システムのような、トラヒックの変動が発生しない。また、従来の移動通信システムでは、たとえば、送信電力制御が完了するまでの間は、回線品質が劣化するが、本発明の移動体通信システムでは、トラヒック変動が低く抑えられているため、回線の品質が劣化しない。さらに、本発明にかかる移動通信システムでは、トラヒック変動が低く抑えられているため、多くの移動局により送信電力が増加されることがなく、従来のように、その消費電力が無駄に消費されてしまうということもない。

【００１４】つぎの発明にかかるチャネル割り当て方法にあっては、過去の通信トラヒックに基づいて、自セル内のトラヒック変動を抑えるように収容チャネル数を決定することにより、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当てるチャネル割り当てステップ（後述する実施の形態のステップＳ１～ステップＳ８，ステップＳ１１～ステップＳ１４，ステップＳ２１～ステップＳ２６に相当）、を含むことを特徴とするものである。

【００１５】この発明によれば、過去の通信トラヒックの統計処理結果である、たとえば、過去の収容チャネル数の平均に基づいて、チャネルを割り当てるため、自セル内のトラヒック変動を低く抑えることができる。これにより、従来のチャネル割り当て方法で発生したような、トラヒックの変動が発生しない。また、従来のチャネル割り当て方法では、たとえば、送信電力制御が完了するまでの間は、回線品質が劣化するが、本発明のチャネル割り当て方法では、トラヒック変動が低く抑えられているため、回線の品質が劣化しない。さらに、本発明にかかるチャネル割り当て方法では、トラヒック変動が低く抑えられているため、多くの移動局により送信電力が増加されることがなく、従来のように、その消費電力が無駄に消費されてしまうということもない。

【００１６】つぎの発明にかかるチャネル割り当て方法において、前記チャネル割り当てステップは、前記通信トラヒックである、過去の回線交換トラヒックおよびパケットトラヒックから収容チャネル数を決定し、さらに、該チャネル数以上のチャネル割り当て要求が発生す

る場合、該バケットを遅延させることにより、一定のチャネル数を保持する遅延ステップ（後述する実施の形態のステップＳ３～ステップＳ５に相当）、を含むことを特徴とするものである。

【００１７】この発明によれば、過去の回線交換トラヒックおよびバケットトラヒックから必要なチャネル数が決定されるため、収容チャネル数以上のチャネル割り当て要求が発生する場合、すなわち、移動局から予約バケットが送信される場合は、その予約バケットに対応する送信データバケットを待機させることにより、チャネル数および通信トラヒックを一定に保持できる。

【００１８】つぎの発明にかかるチャネル割り当て方法において、前記チャネル割り当てステップは、前記チャネル数を一定に保持する場合において、前記バケットが所定の遅延量を超えるとき、割り当てるチャネル数を増やすチャネル増加ステップ（後述する実施の形態のステップＳ１１，ステップＳ１３，ステップＳ１４に相当）、を含むことを特徴とするものである。

【００１９】この発明によれば、収容チャネル数以上のチャネル割り当て要求が発生する場合、すなわち、移動局から予約バケットが送信される場合は、その予約バケットに対応する送信データバケットを待機させ、さらに、収容チャネル数の値を、過去の平均チャネル数と、所定数：Ｎ（システムにより決定される任意の定数）の和の値とする。このとき、所定数：Ｎは、新着予約バケットに対応する送信データバケットを割り当てる前の収容チャネル数としてもよいし、または、送信データバケットの割り当てチャネル数がある一定の変化率を超えないように決定してもよい。これにより、トラヒックの変動を低く抑えながらチャネル割り当てを行うことができる。

【００２０】つぎの発明にかかるチャネル割り当て方法において、前記チャネル割り当てステップは、バケットのデータ長と、前記通信トラヒックである、過去の回線交換トラヒックやバケットトラヒックと、から決定する収容チャネル数に基づいて、音声およびデータを、該収容チャネル数に応じた各チャネルに割り当て、さらに、データ通信終了時に、チャネル数またはトラヒックの急激な変動が発生しないように、音声およびデータのチャネル割り当てを行うことを特徴とするものである（後述する実施の形態のステップＳ７に相当）。

【００２１】この発明によれば、バケットのデータ長に基づいて、チャネル割り当てを行うことから、データ通信終了に伴うチャネル数の減少を抑えることができ、これにより、急激なトラヒックの変動を防止できる。

【００２２】つぎの発明にかかるチャネル割り当て方法において、前記チャネル割り当てステップは、これからチャネルの割り当てを行うバケットのデータ長と、既にチャネルに割り当てられているバケットのデータ長に基づいて、音声およびデータのチャネル割り当てを行うことにより、データ通信終了時に発生する急激なチャネル数の変動を抑制することを特徴とするものである（後述する実施の形態のステップＳ７に相当）。

【００２３】この発明によれば、これからチャネル割り当てを行うバケットのデータ長の最終スロットと、既にチャネルに割り当てられているバケットのデータ長の最終スロットとを、直接確認でき、そして、その確認結果に応じてチャネル割り当てを行うことから、データ通信終了に伴うチャネル数の減少を最小限に抑えることができる。これにより、急激なトラヒックの変動をより強力に防止できる。

【００２４】

【発明の実施の形態】以下に、本発明にかかる移動体通信システム、およびそのシステムにおけるデータのチャネル割り当て方法の実施の形態を図面に基づいて詳細に説明する。なお、この実施の形態によりこの発明が限定されるものではない。

【００２５】図１は、本発明にかかるチャネル割り当て方法を実現する移動体通信システムによる、音声およびデータ（以後、送信データバケットと呼ぶ）のチャネル割り当て結果を示すものである。なお、このチャネル割り当て結果は、たとえば、図２に示すような、通信エリアを構成する基地局１０１と、各移動局（１，２，３，４，５，６，７，８，９，１０）と、の間で、チャネルが割り当てられた結果である。

【００２６】以下、本発明にかかるチャネル割り当て方法を、具体的に説明する。まず、図３は、図２に示すような複数の移動局からの予約バケットが、ランダムに基地局へ到着した状態を示しており、たとえば、それらの各予約バケットを、時間軸を基準に示したものである。また、図４は、図３に示す予約バケットに情報として含まれている、各送信データバケットのバケット長を模式的に示したものである。

【００２７】なお、それらの予約バケットがランダムアクセスチャネルによって送信される場合は、たとえば、図示のとおり（時間ｔ０，ｔ７に相当）、基地局に複数の予約バケットが同時に到着することがある。また、図２における予約バケットの番号は、各移動局の種別（図２に示す移動局１～移動局１０に相当）を表している。また、本実施の形態において、チャネルとは、ＤＳ－ＳＤＭＡ方式における拡散符号により実現されるチャネルを示す。また、各移動局では、必ずしも予約バケットをスロット単位に送信する必要はなく、さらに、ランダムアクセスチャネル以外のチャネルを利用して、基地局へ送信することとしてもよい。

【００２８】図５は、本発明の移動体通信システムにて実行される具体的なチャネル割り当て方法のフローチャートを示す。なお、本発明にかかるチャネル割り当て方法では、即時系の回線交換方式（音声通信）と、待時系のバケット交換方式と、が混在する通信システムで、特

に、バケットチャネルの予約割当てを用いることを前提としており、さらに、図１に示すように、既に２つの音声通信が前記回線交換方式を用いて割り当てられており、時刻ｔ１以前に、チャネル割当て済みのデータバケットｘ１およびｘ２が割り当てられており、過去の平均収容チャネル数が４である場合を前提としている。

【００２９】たとえば、図３に示す時刻ｔ０において、保留している予約バケット数：ＲＳＶｂｕｆの値が１以上か、または、各移動局からの新着予約バケット数：ＲＳＶｎｅｗの値が１以上である場合（ステップＳ１，Ｙｅｓ）は、時刻ｔ０以前に保留している予約バケットに優先度を持たせて、基地局が持つバケット優先度テーブルを更新する（ステップＳ２）。なお、このとき、時刻ｔ０以前に保留している予約バケット数：ＲＳＶｂｕｆが０の場合は、時刻ｔ０において移動局から送信される予約バケットが、最も優先度が高いことになる。

【００３０】一方、時刻ｔ０以前に、保留している予約バケット数：ＲＳＶｂｕｆと新着予約バケット数：ＲＳＶｎｅｗの両方の値が０の場合（ステップＳ１，Ｎｏ）は、送信データバケットのチャネル割り当てを行わない（終了）。ただし、基地局は、移動局が送信する予約バケットに含まれる送信データのバケット長情報をもと、各予約バケットに重み付けを行い、そして、その重み付けられた予約バケットに基づいて、バケット優先度テーブルを作成することとしてもよい。また、予約バケットの優先度は、予め設定されている移動局の番号（たとえば、図３の１から１０に相当）や、たとえば、予約バケット内に含まれる優先度番号により決定することとしてもよいし、または、通話終了時の収容チャネル数の変動が最も小さくなるように決定することとしてもよい。

【００３１】つぎに、基地局では、送信データバケットと、回線交換の音声と、からなる収容チャネル数：ＡＳＳｃｈを更新する（ステップＳ３）。ここで、収容チャネル数：ＡＳＳｃｈの更新方法を、図６に従って、詳細に説明する。

【００３２】たとえば、過去の平均トラヒック、すなわち、チャネル割り当て時からＴ時間以前の平均収容チャネル数：ＴＲＡＦａｖｅ（ここでは、先に４と定義されている）が、新着予約バケット数：ＲＳＶｎｅｗと、次スロットにおいて既に割り当てられているチャネル数：ＲＳＶｏｌｄと、保留している予約バケット数：ＲＳＶｂｕｆの和より大きい場合（ステップＳ１１，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈの値は、ＴＲＡＦａｖｅの値がそのまま代入される（ステップＳ１２）。なお、チャネル割り当て時からＴ時間以前の平均において、ＴＲＡＦａｖｅが整数にならない場合は、小数点以下を切り捨てた値、あるいは平均チャネル数より大きく最も平均チャネル数に近い整数をＴＲＡＦａｖｅとしてもよい。

【００３３】一方、ＴＲＡＦａｖｅがＲＳＶｎｅｗとＲＳＶｏｌｄとＲＳＶｂｕｆの和より小さい場合（ステップＳ１１，Ｎｏ）において、当該予約バケットに対応する送信データバケットの送信許可遅延値：Ｔｂｕｆの値が、当該保留予約バケットに対応する送信データバケットの送信許可最大遅延時間：ＤＬＹｍａｘより小さい場合か、または、ＴＲＡＦａｖｅとＴｂｕｆの積が、すべての新着予約バケットの送信要求データバケット総数：Ｐｎｅｗと、保留予約バケットの送信要求データバケット総数：Ｐｂｕｆとの和より小さい場合（ステップＳ１３，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈの値は、ＴＲＡＦａｖｅと所定数：Ｎ（システムにより決定される任意の定数）の和の値を代入する（ステップＳ１４）。

【００３４】そして、ＴＲＡＦａｖｅがＲＳＶｎｅｗとＲＳＶｏｌｄとＲＳＶｂｕｆの和より小さい場合（ステップＳ１１，Ｎｏ）において、Ｔｂｕｆの値がＤＬＹｍａｘより大きく、さらに、ＴＲＡＦａｖｅとＴｂｕｆの積がＰｎｅｗとＰｂｕｆとの和より大きい場合（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈの値は、ＴＲＡＦａｖｅの値をそのまま代入する（ステップＳ１２）。

【００３５】なお、上記所定数：Ｎは、新着予約バケットに対応する送信データバケットを割り当てる前の収容チャネル数としてもよいし、または、送信データバケットの割り当てチャネル数がある一定の変化率を超えないように決定してもよい。Ｎを、送信データバケットの割り当てチャネル数がある一定の変化率を超えないように決定する場合は、たとえば、その変化率を１割とすることとしてもよいし、または、干渉量の変動が1dB 以内になるような値としてもよいし、または、ＡＳＳｃｈとＲＳＶｏｌｄとの差としてもよい。

【００３６】このように、収容チャネル数：ＡＳＳｃｈを更新（ステップＳ３）後、基地局では、さらに、更新したＡＳＳｃｈとＲＳＶｏｌｄとを比較し（ステップＳ４）、ＲＳＶｏｌｄがＡＳＳｃｈ未満の場合（ステップＳ４，Ｎｏ）は、当該予約バケットに対応する送信データバケットのチャネル割り当てを行い、チャネル割り当てが可能な場合（ステップＳ６，Ｙｅｓ）は、対応する移動局に対してバケット送信指示を行い（ステップＳ７）、再びバケット優先度テーブルを更新する（ステップＳ２）。なお、チャネル割り当て不可能な場合（ステップＳ６，Ｎｏ）は、チャネル割り当てを行うことなく終了する。

【００３７】一方、ステップＳ４における比較において、ＲＳＶｏｌｄがＡＳＳｃｈ以上である場合（ステップＳ４，Ｙｅｓ）は、当該予約バケットに対応する移動局に対して待機指示を行う（ステップＳ５）。

【００３８】ここで、ステップＳ６におけるチャネル割り当て方法を、図７に従って、詳細に説明する。まず、たとえば、予め更新しておいたバケット優先度テーブルの中から、最も優先度が高い予約バケットを選択する

（ステップＳ２１）。そして、選択した予約バケットを割り当てることによる収容チャネルの変動数を求め、該収容チャネルの変動数と、予め設定した収容チャネル許容変動数Ｃとの比較を行い（ステップＳ２２）、たとえば、収容チャネル変動数がＣ以下の場合（ステップＳ２２，Ｙｅｓ）は、選択した予約バケットに対応する送信データバケットのチャネル割当てを行う（ステップＳ２３）。なお、ステップＳ２２の比較において、優先度が最も高い予約バケットの遅延量：ＤＬＹｍａｘが予め設定した予約バケット最大遅延許可量：ＤＬＹｌｉｍを超える場合（ステップＳ２２，ＹＥＳ）も、最も優先度が高い予約バケットに対応する送信データバケットのチャネル割り当てを行う（ステップＳ２３）。

【００３９】一方、ステップＳ２２の比較において、前記収容チャネル変動数がＣより大きい場合（ステップＳ２２，Ｎｏ）は、予め更新しておいたバケット優先度テーブルの中から、つぎに優先度の高い予約バケットを選択する（ステップＳ２４）。そして、予め再選択することを決められている、優先度が高い方から再選択可能予約バケットまでの予約バケット数と、所定数：Ｌを比較し（ステップＳ２５）、再選択可能な予約バケット数がＬ以下の場合（ステップＳ２５，Ｙｅｓ）は、再選択した予約バケットを割り当てることによる収容チャネル変動数を求め、再度収容チャネル変動率とＣとの比較を行う（ステップＳ２２）。なお、Ｃの値は、予め設定した固定値としてもよいし。または、収容チャネル数に対応する割合から求まる値としてもよい。また、収容チャネル変動数は、予約バケットを割り当てることにより生じる変動だけでなく、既に収容しているチャネルの通信終了に伴う収容チャネル変動を含んでいてもよい。

【００４０】また、ステップＳ２５の比較において、再選択した予約バケット数がＬより大きい場合や、選択する予約バケットがない場合（ステップＳ２５，Ｎｏ）は、チャネル割り当てを行わない（ステップＳ２６）。

【００４１】つぎに、実際に、図３の予約バケットに対応する送信データバケット（図４参照）を割り当てる場合について、図５、図６、および図７のチャネル割り当て方法に従って、説明する。なお、ここでは、Ｔの値を２バケットスロット長とし、たとえば、平均チャネル数が割り切れない場合は、平均チャネル数より小さく最も平均チャネル数に近い整数をＴＲＡＦａｖｅとし、さらに、Ｔｂｕｆの値を２、ＴＲＡＦａｖｅの過去の値を４、許容収容チャネル変動率Ｃを１、再選択可能予約バケット数Ｌを１、予約バケットの最大遅延許可量：ＤＬＹｌｉｍを５バケット長、所定数：Ｎを１、と仮定して、図２の予約バケットが基地局に到着した場合のチャネル割当て動作を説明する。

【００４２】また、基地局が予約バケットを受けると、基地局は、一定遅延後に、バケット送信指示（図５のステップＳ８）や待機指示（図５のステップＳ５）を行い、さらに、移動局も、当該バケット送信指示や待機指示を受けて、一定遅延後に、送信データバケットの送信を行うものとする。なお、ここでは、移動局および基地局の送信遅延時間を、たとえば、１バケットスロット長とする。

【００４３】従って、移動局が送信した予約バケットに対応して、基地局では、１バケットスロット長後に、バケット送信指示を与え、その後、移動局でも、１バケットスロット長後に、送信データバケットの送信を行うこととなる。なお、本実施の形態では、待機指示を行わない場合でも、基地局から移動局へ指示を出さないことをもって、待機指示としてもよい。また、移動局および基地局の送信遅延時間は、１バケットスロット長より長くてもよく、この限りではない。

【００４４】まず、図３に示す時刻ｔ１においては、時刻ｔ０以前に保留している予約バケットがなく、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが２であり、ＲＳＶｎｅｗが２（予約バケット（１）、予約バケット（２））であり、ＲＳＶｂｕｆが０であるため（ステップＳ１１，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、４である。従って、ここでは、基地局は、図１の時刻ｔ２に、送信データバケット（１）、および送信データバケット（２）のチャネル割り当てを行い、さらに、予約バケット（１）および予約バケット（２）を送信した移動局に対してバケット送信指示を行う。

【００４５】つぎに、図３に示す時刻ｔ２においては、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが４であり、ＲＳＶｎｅｗが１（予約バケット（３））であり、ＲＳＶｂｕｆが０であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが０であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが５であり、Ｐｂｕｆが０であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となり、基地局では、予約バケット（３）を送信した移動局に対して保留指示を行う。

【００４６】つぎに、図３に示す時刻ｔ３においては、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが４であり、ＲＳＶｎｅｗが１（予約バケット（４））であり、ＲＳＶｂｕｆが１（予約バケット（３））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが１（予約バケット（３））であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが４であり、Ｐｂｕｆが５であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となり、基地局では、予約バケット（４）を送信した移動局に対して保留指示を行う。

【００４７】つぎに、図３に示す時刻ｔ４においては、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが４であり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが２（予約バケット（３）、予約バケット（４））であり（ステップＳ

１１，Ｎｏ）、さらに、ＤＬＹｍａｘが２（予約バケット（３））であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが０であり、Ｐｂｕｆが９であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となり、基地局では、何も指示を行わない。

【００４８】つぎに、図３に示す時刻ｔ５においては、ＴＲＡＦａｖｅが４であり、データバケット（１）が終了するためＲＳＶｏｌｄが３であり、ＲＳＶｎｅｗが１（予約バケット（５））であり、ＲＳＶｂｕｆが２（予約バケット（３）、予約バケット（４））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが３（予約バケット（３））であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが３であり、Ｐｂｕｆが９であるため（ステップＳ１３，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、５となる。従って、基地局では、図１の時刻ｔ６に、たとえば、優先度デーブルの最も優先度の高い予約バケットである、予約バケット（３）に対応する送信データバケット（３）のチャネル割り当てを行い、さらに、予約バケット（３）を送信した移動局に対してバケット送信指示を行う。

【００４９】また、つぎに優先度の高い予約バケットである、予約バケット（４）に対応する送信データバケットに対しては、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが４であり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが２（予約バケット（４）、予約バケット（５））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが２（予約バケット（４））であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが０であり、Ｐｂｕｆが７であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となり、基地局では、何も指示を行わない。すなわち、新たなチャネルの割り当ては行わない。

【００５０】つぎに、図３に示す時刻ｔ６においては、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが４であり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが２（予約バケット（４）、予約バケット（５））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが３（予約バケット（４））であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが０であり、Ｐｂｕｆが７であるため（ステップＳ１３，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、５となる。

【００５１】このとき、基地局では、予約バケットの到着順に優先度を決定すると、予約バケット（４）が予約バケット（５）より優先度が高くなるが、予約バケット（４）を選択すると、既にチャネル割当てを完了しているデータバケット（３）の通信終了時刻とデータバケット（４）の通信終了時刻が同時刻となるため、収容チャネル数の変動がより少ない予約バケット（５）を優先して選択する。従って、基地局では、図１の時刻ｔ７に、たとえば、収容チャネル数の変動がより少ない予約バケットである、予約バケット（５）に対応する送信データバケット（５）のチャネル割り当てを行い、さらに、予約バケット（５）を送信した移動局に対してバケット送信指示を行う。

【００５２】つぎに、図３に示す時刻ｔ７においては、ＴＲＡＦａｖｅが４であり、１つの音声通信の終了に伴いＲＳＶｏｌｄが３となり、ＲＳＶｎｅｗが０であるため（ステップＳ１１，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、４となる。従って、基地局では、図１の時刻ｔ８に、たとえば、優先度デーブルの最も優先度の高い予約バケットである、予約バケット（４）に対応する送信データバケット（４）のチャネル割り当てを行い、さらに、予約バケット（４）を送信した移動局に対してバケット送信指示を行う。

【００５３】つぎに、図３に示す時刻ｔ８においては、ＴＲＡＦａｖｅが４であり、ＲＳＶｏｌｄが４であり、ＲＳＶｎｅｗが３であり、ＲＳＶｂｕｆが０であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが０であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが１０であり、Ｐｂｕｆが０であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となり、基地局では、何も指示を行わない。すなわち、新たなチャネルの割り当ては行わない。

【００５４】つぎに、図３に示す時刻ｔ９においては、ＴＲＡＦａｖｅが４であり、データバケット５の通信終了に伴いＲＳＶｏｌｄが３となり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが３（予約バケット（６）、予約バケット（７）、予約バケット（８））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが１であり、ＴＲＡＦａｖｅ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが０であり、Ｐｂｕｆが１０であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となる。従って、基地局では、図１の時刻ｔ１０に、たとえば、優先度デーブルの最も優先度の高い予約バケットである、予約バケット（６）に対応する送信データバケット（６）のチャネル割り当てを行い、さらに、予約バケット（６）を送信した移動局に対してバケット送信指示を行う。

【００５５】つぎに、図３に示す時刻ｔ１０においては、ＴＲＡＦａｖｅが４であり、データバケット（３）の通信終了に伴いＲＳＶｏｌｄが３となり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが２（予約バケット（７）、予約バケット（８））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが２であり、ＴＲＡＦａｖ（＝４）とＴｂｕｆ（＝３）との積が１２であり、Ｐｎｅｗが０であり、Ｐｂｕｆが１０であるため（ステップＳ１３，Ｎｏ）、収容チャネル数：ＡＳＳｃｈは、４となる。従って、基地局では、図１の時刻ｔ１

１に、たとえば、優先度テーブルの最も優先度の高い予約バケットである、予約バケット（７）に対応する送信データバケット（７）のチャネル割り当てを行い、さらに、予約バケット（７）を送信した移動局に対してバケット送信指示を行う。

【００５６】つぎに、図３に示す時刻ｔ１１においては、ＴＲＡＦａｖｅが４であり、データバケット（４）の通信終了に伴いＲＳＶｏｌｄは３となり、ＲＳＶｎｅｗが１（予約バケット（９））であり、ＲＳＶｂｕｆは１（予約バケット（８））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが３であるため（ステップＳ１３，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、５となる。

【００５７】このとき、基地局では、予約バケットの到着順に優先度を決定すると、予約バケット（８）が予約バケット（９）より優先度が高くなるが、予約バケット（８）を選択すると、既にチャネル割当てを完了しているデータバケット（６）の通信終了時刻とデータバケット（８）の通信終了時刻が同時刻となるため、収容チャネル数の変動がより少ない予約バケット（９）を優先して選択する。従って、基地局では、図１の時刻ｔ１２に、たとえば、収容チャネル数の変動がより少ない予約バケットである、予約バケット（９）に対応する送信データバケット（９）のチャネル割り当てを行い、さらに、予約バケット（９）を送信した移動局に対してバケット送信指示を行う。

【００５８】また、基地局では、バケット優先度テーブルを更新後、再度ＡＳＳｃｈを更新する。このとき、ＴＲＡＦａｖｅが４であり、データバケット（４）の通信終了とデータバケット（９）の割り当てに伴いＲＳＶｏｌｄが４となり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが１（予約バケット（８））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが４であるため（ステップＳ１３，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、５となるが、予約バケット（８）は、収容チャネル変動数を満たさず、さらに、割り当てる予約バケットがないため、チャネル割り当ては行われない。

【００５９】つぎに、図３に示す時刻ｔ１２においては、ＴＲＡＦａｖｅが４であり、データバケット（９）の通信終了に伴いＲＳＶｏｌｄが３となり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが１（予約バケット（８））であり、ＤＬＹｍａｘが４であるため（ステップＳ１１，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、４となる。しかしながら、基地局では、予約バケット（８）を選択すると、既にチャネル割当てを完了しているデータバケット（７）の通信終了時刻とデータバケット（８）の通信終了時刻が同時刻となるため、データバケット（８）のチャネル割当ては行われない。

【００６０】最後に、図３に示す時刻ｔ１３においては、ＴＲＡＦａｖｅが３であり、データバケット（６）、およびデータバケット（７）の通信終了に伴いＲＳＶｏｌｄが２となり、ＲＳＶｎｅｗが１（予約バケット（１０））であり、ＲＳＶｂｕｆが１（予約バケット（８））であり、ＤＬＹｍａｘが５であるため（ステップＳ１１，Ｙｅｓ）、収容チャネル数：ＡＳＳｃｈは、４となる。しかしながら、基地局では、予約バケット（８）を選択すると、収容チャネル変動数が２になるため、つぎに優先度の高い予約バケット（１０）を選択し、図１の時刻ｔ１４に、予約バケット（１０）に対応する送信データバケット（１０）のチャネル割り当てを行い、さらに、予約バケット（１０）を送信した移動局に対してバケット送信指示を行う。

【００６１】また、基地局では、バケット優先度テーブルを更新後、再度ＡＳＳｃｈを更新する。このとき、ＴＲＡＦａｖｅが３であり、データバケット（６）の通信終了とデータバケット（１０）の割当てに伴いＲＳＶｏｌｄが３となり、ＲＳＶｎｅｗが０であり、ＲＳＶｂｕｆが１（予約バケット（８））であり（ステップＳ１１，Ｎｏ）、さらに、ＤＬＹｍａｘが６であるため、収容チャネル数：ＡＳＳｃｈは、４となるが、予約バケット（８）は、ＤＬＹｌｉｍを越えているので収容バケット変動数に係わらずチャネル割当てが行われ、さらに、予約バケット（８）を送信した移動局に対してバケット送信指示を行う。

【００６２】なお、本実施の形態では、音声と送信データバケットとが混在する場合について説明したが、たとえば、送信データバケットだけの場合でも動作はかわらない。また、同様に、送信データバケットと音声バケットとが混在する場合でも動作はかわらない。また、送信データバケットと音声バケットとが混在する場合はついては、送信データバケット用の最大許容遅延量と音声バケット用の最大許容遅延量とを分けて設定してもよい。

【００６３】このように、本発明にかかるチャネル割り当て方法においては、従来のように、移動局の発呼や終話によるトラヒックの変動が要因となる、干渉量の急激な変動を発生させることなく、たとえば、一定の通信品質を保てるように、音声および送信データバケットのチャネル割り当てを行うことができる。

【００６４】

【発明の効果】以上、説明したとおり、この発明によれば、過去の通信トラヒックの統計処理結果である、たとえば、過去の収容チャネル数の平均に基づいて、チャネルを割り当てるため、自セル内のトラヒック変動を低く抑えることができる。これにより、従来の移動体通信システムのような、トラヒックの変動が発生しない、という効果を奏する。また、従来の移動通信システムでは、送信電力制御が完了するまでの間は、回線品質が劣化するが、本発明の移動体通信システムでは、トラヒック変動が低く抑えられているため、回線の品質が劣化しない、という効果を奏する。さらに、本発明にかかる移動

通信システムでは、トラヒック変動が低く抑えられているため、多くの移動局により送信電力が増加されることがなく、従来のように、その消費電力が無駄に消費されてしまうことがない、という効果を奏する。

【００６５】つぎの発明によれば、過去の通信トラヒックの統計処理結果である、たとえば、過去の収容チャネル数の平均に基づいて、チャネルを割り当てるため、自セル内のトラヒック変動を低く抑えることができる。これにより、従来のチャネル割り当て方法で発生したような、トラヒックの変動が発生しない、という効果を奏する。また、従来のチャネル割り当て方法では、たとえば、送信電力制御が完了するまでの間は、回線品質が劣化するが、本発明のチャネル割り当て方法では、トラヒック変動が低く抑えられているため、回線の品質が劣化しない、という効果を奏する。さらに、本発明にかかるチャネル割り当て方法では、トラヒック変動が低く抑えられているため、多くの移動局により送信電力が増加されることがなく、従来のように、その消費電力が無駄に消費されてしまうことがない、という効果を奏する。

【００６６】つぎの発明によれば、過去の回線交換トラヒックおよびバケットトラヒックから必要なチャネル数が決定されるため、収容チャネル数以上のチャネル割り当て要求が発生する場合、すなわち、移動局から予約バケットが送信される場合は、その予約バケットに対応する送信データバケットを待機させることにより、チャネル数および通信トラヒックを一定に保持できる、という効果を奏する。

【００６７】つぎの発明によれば、収容チャネル数以上のチャネル割り当て要求が発生する場合、すなわち、移動局から予約バケットが送信される場合は、その予約バケットに対応する送信データバケットを待機させ、さらに、収容チャネル数の値を、過去の平均チャネル数と、所定数：Ｎ（システムにより決定される任意の定数）の和の値とする。このとき、所定数：Ｎは、新着予約バケットに対応する送信データバケットを割り当てる前の収容チャネル数としてもよいし、または、送信データバケットの割り当てチャネル数がある一定の変化率を超えないように決定してもよい。これにより、トラヒックの変動を低く抑えながらチャネル割り当てを行うことができる、という効果を奏する。

【００６８】つぎの発明によれば、バケットのデータ長に基づいて、チャネル割り当てを行うことから、データ通信終了に伴うチャネル数の減少を抑えることができ、これにより、急激なトラヒックの変動を防止できる、という効果を奏する。

【００６９】つぎの発明によれば、これからチャネル割り当てを行うバケットのデータ長の最終スロットと、既にチャネルに割り当てられているバケットのデータ長の最終スロットとを、直接確認でき、そして、その確認結果に応じてチャネル割り当てを行うことから、データ通信終了に伴うチャネル数の減少を最小限に抑えることができる。これにより、急激なトラヒックの変動をより強力に防止できる、という効果を奏する。

【００７０】従って、本発明によれば、移動局の発呼や終話によるトラヒックの変動が要因となる、干渉量の急激な変動を発生させることなく、一定の通信品質を保てるように、音声およびデータのチャネル割り当てを行う移動体通信システムを提供できる。

【図面の簡単な説明】

【図１】　本発明にかかるチャネル割り当て方法を実現する移動体通信システムによる、音声およびデータのチャネル割り当て結果を示す図である。

【図２】　移動体通信システムの構成を示す図である。

【図３】　複数の移動局からの予約バケットがランダムに基地局へ到着した状態を示す図である。

【図４】　予約バケットに情報として含まれている各送信データバケットのバケット長を模式的に示す図である。

【図５】　本発明の移動体通信システムにて実行される具体的なチャネル割り当て方法を示すフローチャートである。

【図６】　収容チャネル数：ＡＳＳｃｈの更新方法を示すフローチャートである。

【図７】　具体的なチャネル割り当て方法を示すフローチャートである。

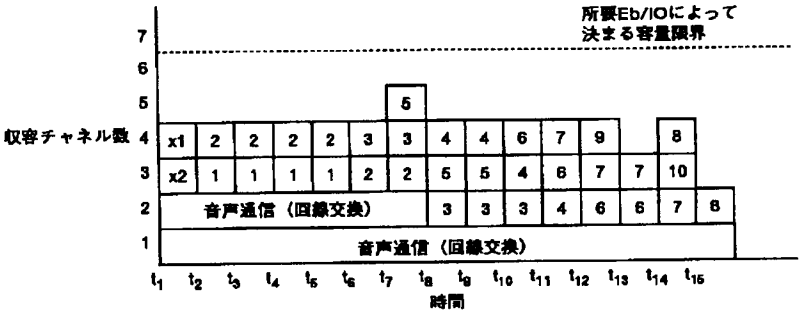
【図８】　従来の移動体通信システムによる音声およびデータのチャネル割り当て結果を示す図である。

【図９】　予約バケットに情報として含まれている各送信データバケットのバケット長を模式的に示す図である。

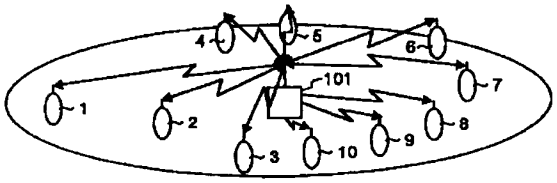
【符号の説明】

１０１　基地局、１，２，３，４，５，６，７，８，９，１０　移動局。

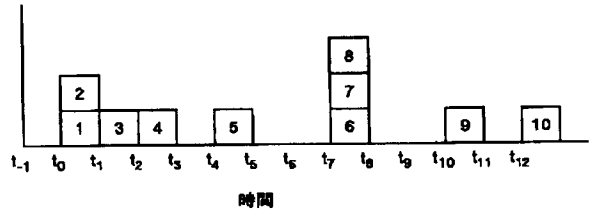
【図１】


所要Eb/I0によって
決まる容量限界
収容チャネル数
音声通信（回線交換）
音声通信（回線交換）
時間

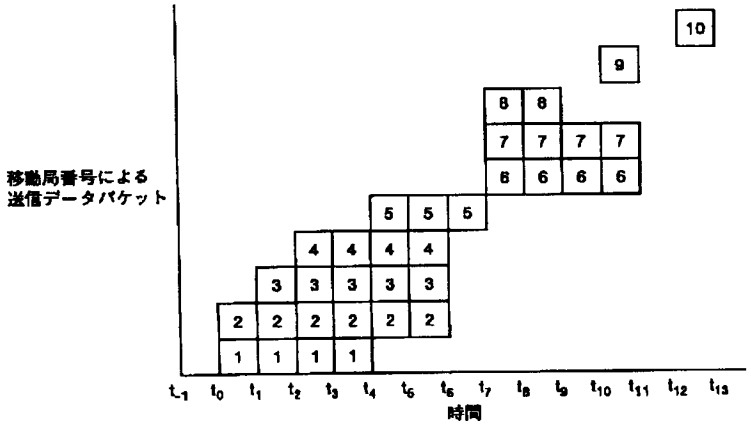
【図２】


101

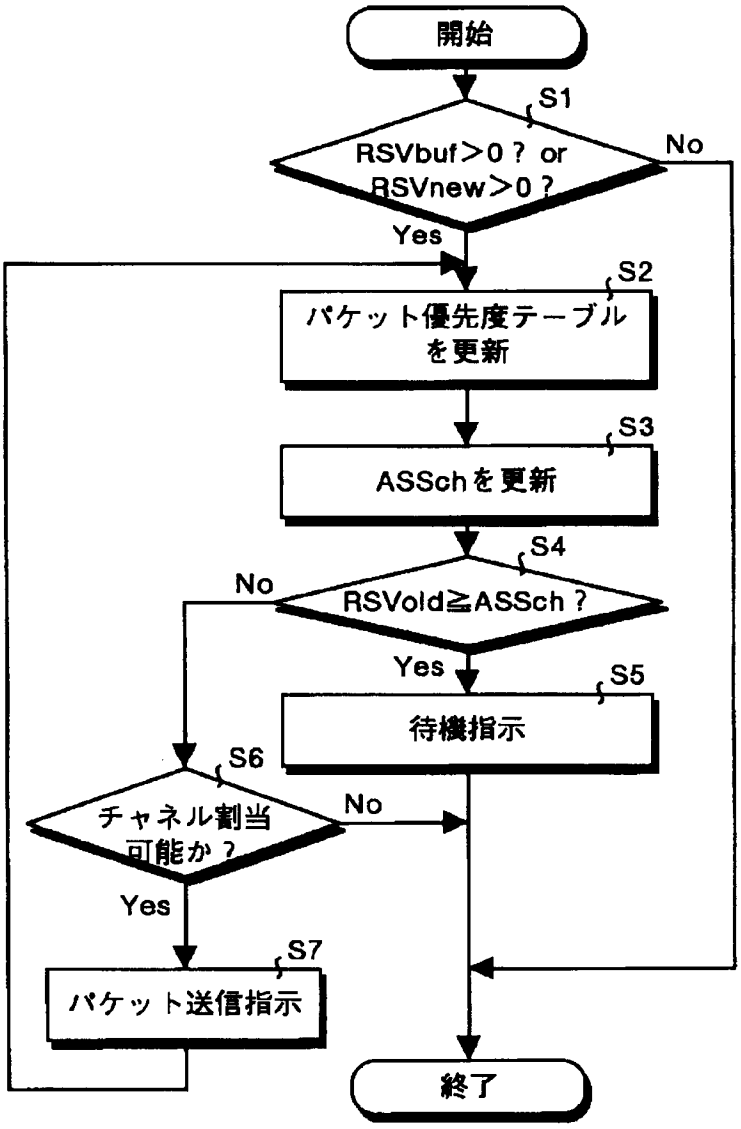
【図３】


予約パケット
時間

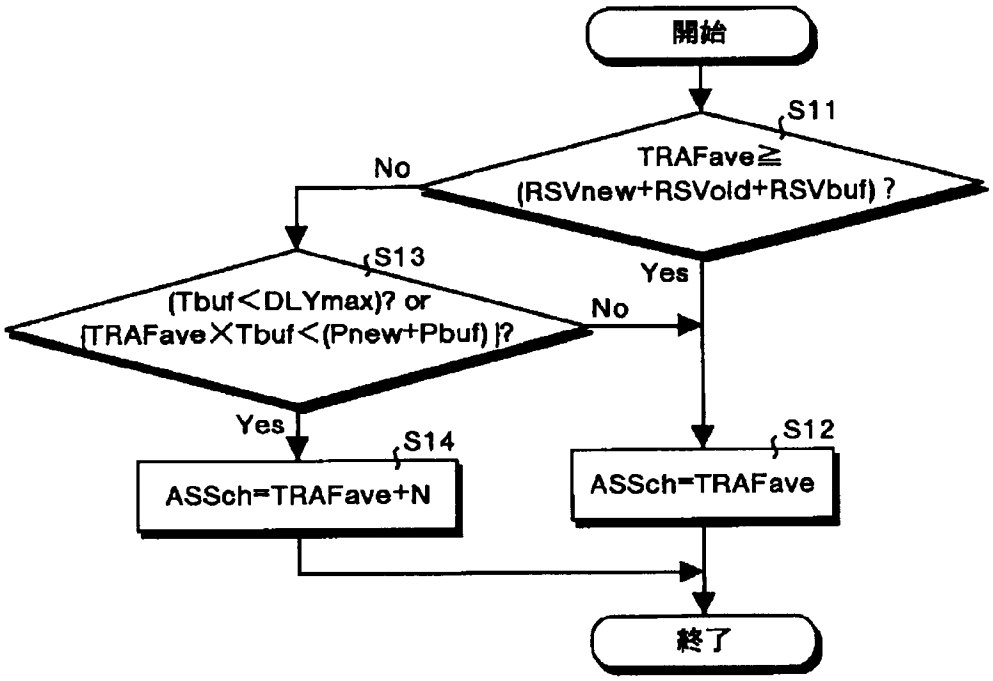
【図４】


移動局番号による
送信データパケット
時間

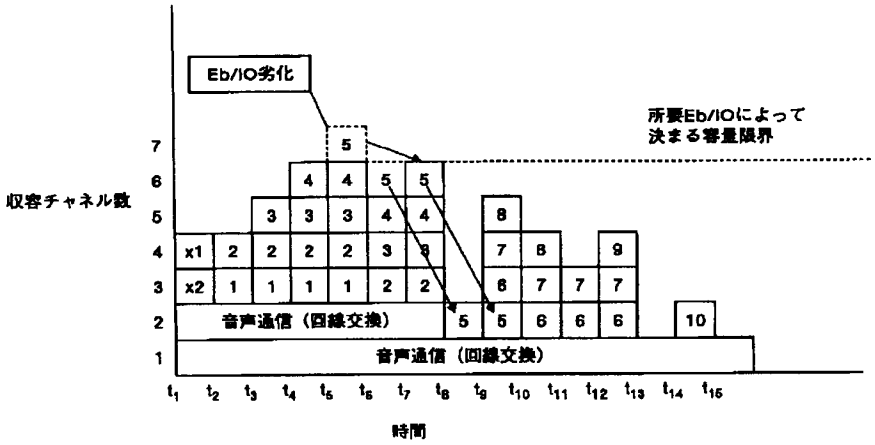
【図５】


開始
S1
RSVbuf＞0？ or
RSVnew＞0？
No
Yes
S2
パケット優先度テーブル
を更新
S3
ASSchを更新
S4
No
RSVold≧ASSch？
Yes
S5
待機指示
S6
チャネル割当
可能か？
No
Yes
S7
パケット送信指示
終了

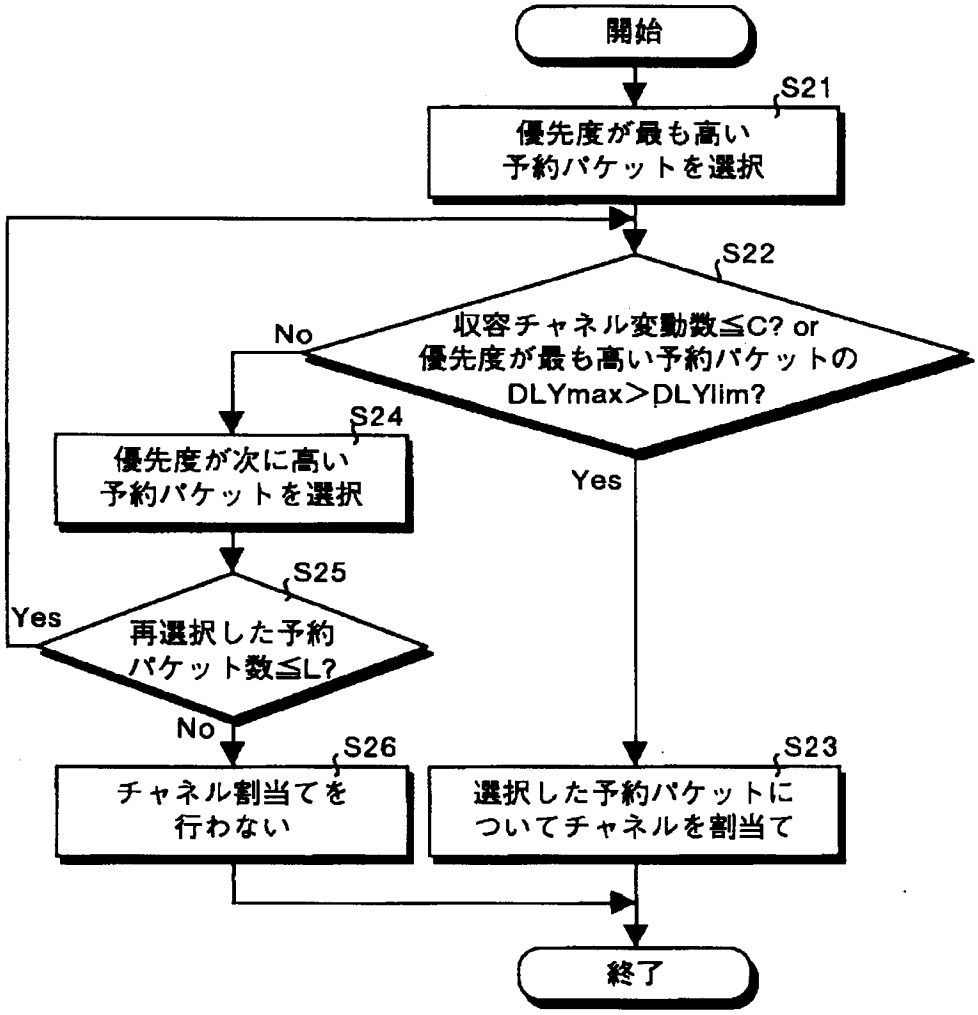
【図６】


開始
S11
TRAFave≧
(RSVnew+RSVold+RSVbuf)?
No
Yes
S13
(Tbuf＜DLYmax)? or
(TRAFave×Tbuf＜(Pnew+Pbuf))?
No
Yes
S14
ASSch=TRAFave+N
S12
ASSch=TRAFave
終了

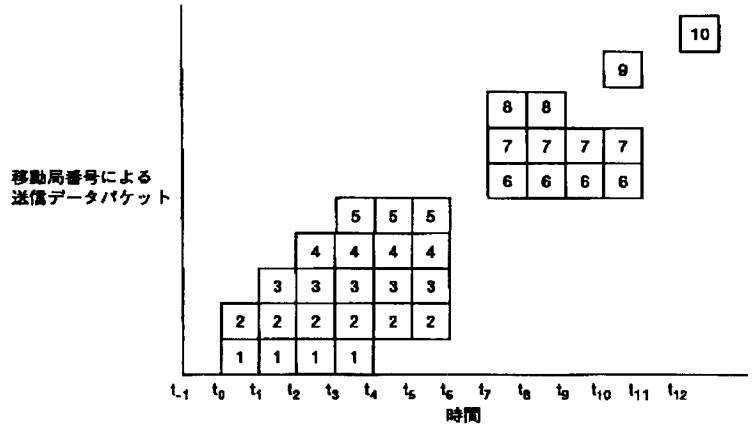
【図８】


Eb/IO劣化
所要Eb/IOによって
決まる容量限界
収容チャネル数
音声通信（回線交換）
音声通信（回線交換）
時間

【図７】


開始
S21
優先度が最も高い
予約パケットを選択
S22
No
収容チャネル変動数≦C? or
優先度が最も高い予約パケットの
DLYmax>DLYlim?
S24
優先度が次に高い
予約パケットを選択
Yes
S25
Yes
再選択した予約
パケット数≦L?
No
S26
チャネル割当てを
行わない
S23
選択した予約パケットに
ついてチャネルを割当て
終了

【図９】


移動局番号による
送信データパケット
10
9
8 8
7 7 7 7
6 6 6 6
5 5 5
4 4 4 4
3 3 3 3 3
2 2 2 2 2 2
1 1 1 1
t-1 t0 t1 t2 t3 t4 t5 t6 t7 t8 t9 t10 t11 t12
時間